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FUNDAMENTALS OF BUSINESS MANAGEMENT

**Business Case 3:  
Data-Driven Budgeting And Forecasting  
A Case Study on Fiasconaro**



Team *InsAIght*

Matilde Contestabile

Martina Russo

Alice Malfatti

Vincenzo Manzo

Matilde Polezzi

Narangoo Altangerel

Ramya Shravani Dasiga

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# Introduction

Designing a tailored solution for Fiasconaro's forecasting and budgeting needs has been an ambitious yet rewarding journey. Our goal was to create a dynamic, AI-powered system capable of addressing the company's unique challenges, particularly the strong seasonality and high production demands tied to festive periods.

From the outset, we encountered several challenges: *understanding the scope of the task, coordinating our diverse skills and perspectives, and staying aligned under tight deadlines*. Yet, these hurdles became opportunities for growth. Along the way, we bonded as a team, blending professional rigor with personal connection. By embracing the learning curve and harnessing our individual strengths, we turned unfamiliar territory into a platform for discovery and collaboration.

To tackle the challenge, we experimented with assigning roles aligned to our aspirations and natural inclinations. This approach made the process both meaningful and enjoyable, giving us insight into how our individual goals could shape our future careers. However, our contributions extended far beyond these formal roles. Through overlapping and complementary efforts, we ensured that our solution was coherent, comprehensive, and greater than the sum of its parts.

The result of our efforts is this report, which provides a detailed journey—from an analysis of Fiasconaro's niche market to a practical proof of concept for our software.

## Methodology

This report is structured to offer both an economic and technical perspective on solving Fiasconaro's forecasting and budgeting challenges. Beyond the creative task of designing the software architecture, we conducted a practical exercise to showcase its potential. Using the SARIMA algorithm, we forecasted demand based on historical data, which we then applied to create a detailed budget projection for 2024. This exercise serves as a proof of concept, demonstrating how the software could be used in real-world scenarios to support dynamic and informed financial decision-making.

# The Team

Our team name, **InsAIght**, reflects our vision and the spirit of our collaboration. Inspired by our shared passion for AI, coupled with growing expertise in financial analysis, production planning, and strategy, we united our strengths to tackle the challenge. While each member assumed a specific role aligned with their unique skills and aspirations, our true strength lay in our seamless teamwork and collective effort, which ensured a cohesive and impactful solution.



## 1. Strategic Planning Manager: Matilde Contestabile, the Leader



- Lead project execution, ensuring collaboration, progress tracking, and issue resolution.
- Review and approve final deliverables to maintain high-quality standards.
- Ensure adherence to project timelines and objectives.
- Oversee the definition of drivers and KPIs for Fiasconaro's forecasting process.
- Design the UX/UI mockup for the software.

## 2. Market Research Analyst: Ramya Shravani Dasiga



- Lead the market research and analysis of Fiasconaro's industry.
- Conduct analysis on market trends, consumer behavior, and competition.
- Assess seasonality and off-season dynamics of the market.
- Perform competitor benchmarking and positioning.

## 3. Financial Analyst: Martina Russo



- Conduct a thorough financial ratio analysis of Fiasconaro.
- Perform trend analysis of current management ratios and historical financial data.
- Prepare the financial outlook for 2024.
- Analyze historical data series to identify long-term trends and market dynamics.
- Provide insights into external factors impacting company performance, supporting strategic decisions.

#### 4. Forecasting and Budget Specialist: Alice Malfatti



- Lead the budgeting process for Fiasconaro, focusing on the development of a comprehensive financial plan for 2024.
- Ensure that all cost considerations, including raw materials, production costs, and overheads, are accurately included in the budget.
- Regularly update and adjust the budget based on real-time data and market trends.
- Collaborate with other team members to ensure alignment between forecasting, budgeting, and actual financial performance.

#### 5. Data Scientist – Forecasting Expert: Vincenzo Manzo



- Develop data-driven models to support strategic decision-making.
- Prepare and analyze data for forecasting, focusing on quarterly sales and inventory.
- Implement the SARIMA model for forecasting 2024 sales and inventory.
- Contribute to the construction of the 2024 budget based on forecasting results.

#### 6. Marketing Strategist: Narangoo Altangerel



- Identify the challenges in financial forecasting for Fiasconaro.
- Provide insights into AI's role in enhancing revenue forecasting, demand planning, and cost analysis.
- Define the specific drivers and KPIs for Fiasconaro's forecasting process.

#### 7. IT Systems Analyst: Matilde Polezzi



- Manage IT systems to support data analysis and forecasting.
- Oversee the development and integration of the forecasting and budgeting software.
- Ensure that key features such as real-time data integration, intelligent chatbot assistance, and forecasting accuracy tracking are implemented.
- Manage the software implementation timeline.

# Chapter 1

## Fiasconaro: A Tradition of Excellence in Artisan Pastry

**Fiasconaro** is an Italian company specializing in the production and sale of artisan **colombe** and **panettoni**, high-quality Italian desserts traditionally associated with Easter and Christmas, respectively. This family-run business was founded in 1953 by the late Mario Fiasconaro when he founded a small ice cream shop and became known for its citrus granitas made with local snow. Situated in the heart of the Madonie Mountains, in Castelbuono (PA).

Their dedication to local production has fostered sustainable relationships with over 200 local suppliers, further reinforcing their “Made in Sicily” ethos. Regarding this all the ingredients they use are sourced *in loco* and prepared using natural sourdough. This technique endows the products with a unique aroma and softness, with the preparation process for a single product taking up to three days. Key policies that drove its success include sourcing high-quality local ingredients, such as Sicilian citrus fruits, pistachios, almonds, and manna (a natural sap from ash trees).



Figure 1.1: Inside of Castelnuovo shop.

Today, under the leadership of the third generation of the Fiasconaro family, brothers Nicola, Fausto, and Martino, the company has grown into an international enterprise, reaching over 70 countries worldwide. Their management has elevated the business to new heights, with a team of 127 employees and an annual turnover exceeding €21 million.

Its product range masterfully balances *classic* recipes with *refined* and innovative flavors, exemplified by specialties like organic panettoni, crafted with certified organic ingredients and free from preservatives, as well as iconic desserts such as the “Montenero,” a tribute to founder Mario Fiasconaro.

Fiasconaro is also redefining the concept of artisanal pastry by embracing digital advancements and expanding its product line to meet the needs of an increasingly diverse and international clientele. The company's fully revamped e-commerce platform offers a personalized shopping experience, enabling customers to explore a comprehensive catalog, create custom gift combinations for special events, and enjoy seamless delivery services. With optimized shipping processes, Fiasconaro ensures the freshness and quality of its products, even in distant markets such as Japan and the United States, solidifying its position as a global ambassador of Sicilian confectionery.

Luxury collaborations are a cornerstone of Fiasconaro's strategy, propelling the brand to new heights of prestige. Among the most celebrated is the partnership with *Dolce & Gabbana*, which has produced luxurious panettone showcased in elegant, hand-crafted Sicilian ceramic boxes. These limited-edition creations celebrate the richness of Sicilian culture and the excellence of Italian craftsmanship.

Fiasconaro's reputation as a symbol of Italian excellence is further solidified through its participation in prestigious international events, including the *White House Christmas Celebration*, the *Salone del Gusto* in Turin, and the *Cibus* fair in Parma. Its journey is marked by numerous awards and initiatives that have elevated the company's profile on the global stage.

In addition, events such as the *Gran Gala d'Autunno* and the celebrations of Fiasconaro's 70th anniversary emphasize the company's commitment to blending fine pastry with the cultural heritage of Castelbuono, reinforcing its legacy as a global ambassador of Sicilian tradition.

Fiasconaro has achieved several significant certifications that demonstrate its commitment to quality and authenticity. The company is **ISO 9001** certified, which guarantees a robust quality management system to ensure consistent excellence in its production processes. Additionally, it holds the **IFS Food Certification**, a globally recognized standard for food safety and quality. Moreover, Fiasconaro proudly carries the **Made in Italy** certification, emphasizing the entirely Italian origin of its products and aligning them with traditional craftsmanship, further strengthening its authenticity and reputation.

Through its innovative spirit, dedication to tradition, and strategic collaborations, Fiasconaro has transcended its role as a confectionery producer to become a living symbol of Sicilian culture and artisanal excellence. The seamless integration of advanced e-commerce, a diverse product portfolio, and prestigious partnerships positions the company as a leader in the sector, while its strong connection to its cultural and artisanal roots ensures its legacy as an icon of Italian gastronomy.



Figure 1.2: Collaboration between Fiasconaro and *Dolce & Gabbana*.

# Chapter 2

## Industry and Market Position Analysis

### 2.1 Market Analysis

Fiasconaro operates within the artisanal **premium baked goods sector**, specializing in high-quality *panettone* and *colomba*, both products rooted in Italian tradition. Historically, these goods have been associated with specific holidays, resulting in **strong seasonal demand** during Christmas and Easter. However, shifting global trends in gourmet and luxury confectionery are pushing for year-round availability, creating new opportunities for brands like Fiasconaro to expand beyond traditional seasonal boundaries.

#### 2.1.1 Market Overview and Consumer Trends

The **global panettone market** is valued at approximately **€600 million** annually, with the **premium segment** estimated at **€120 to €150 million**, growing at **5% to 7% per year**. This growth is driven by rising disposable incomes, a growing interest in gourmet and artisanal products, and the increasing global appreciation for Italian culinary traditions. No longer limited to specific holidays, the demand for premium baked goods is becoming year-round, particularly in emerging markets. Consumers in the premium baked goods sector are increasingly looking for

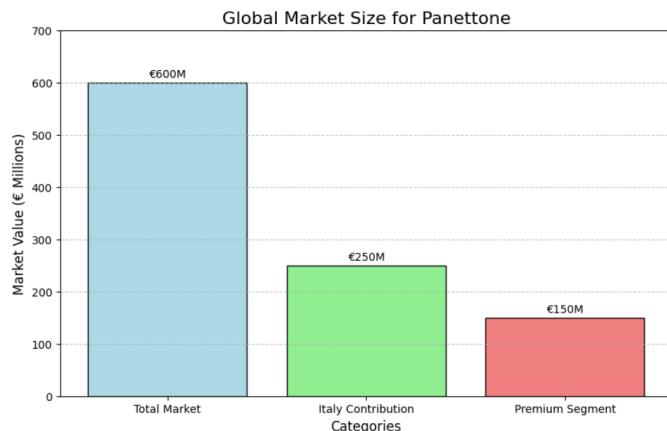


Figure 2.1: *Global Market Size for Panettone.*

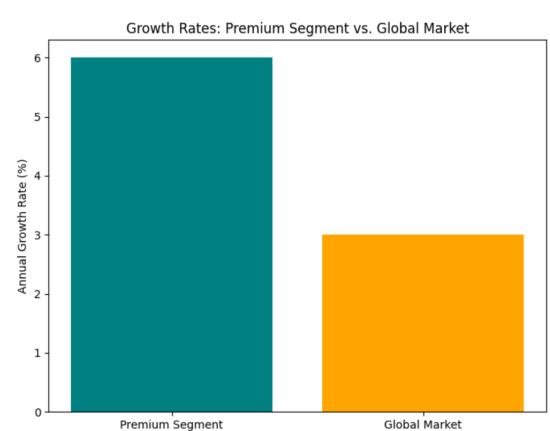


Figure 2.2: *Market Growth.*

**high-quality, artisanal products** crafted with **natural ingredients** and distinctive flavors that reflect cultural heritage. Authenticity, craftsmanship, and storytelling are critical drivers of purchasing decisions. Additionally, sustainability has become a major factor, with **65% of European consumers** and **50% of North American consumers** prioritizing eco-conscious practices when selecting products.

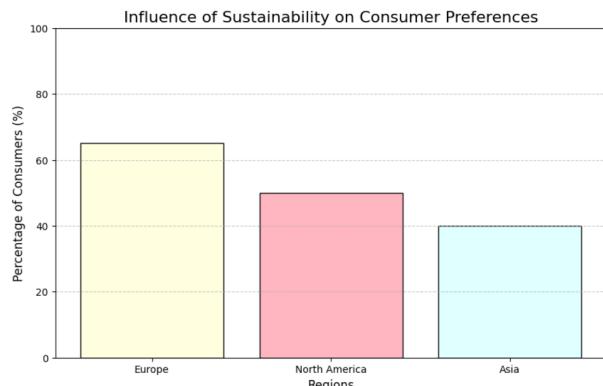


Figure 2.3: *Influence of Sustainability on Consumer Preferences.*

These evolving preferences create a significant opportunity for brands like Fiasconaro. By leveraging its **Sicilian heritage** and commitment to **artisanal craftsmanship**, Fiasconaro is well-positioned to capitalize on the rising demand for premium, authentic, and sustainable baked goods. The brand's focus on blending tradition with innovation aligns perfectly with current consumer expectations, ensuring its place in the expanding luxury market.

Pricing further illustrates the luxury positioning of these products, typically ranging from **€25 to €70 per unit**. Exclusive editions, such as collaborations with high-fashion brands like Dolce & Gabbana, can exceed **€100 per unit**.

These high prices reflect the elevated expectations of consumers, who seek products that combine exceptional taste, cultural significance, and exclusivity.

## Fiasconaro's Market Share

Fiasconaro's market position is a testament to its heritage and commitment to quality. With annual revenues of **€20 million**, the company holds an estimated **3% to 4% share** of the global premium panettone market. Although this share may appear modest, it represents a significant presence within the highly specialized premium segment. Domestically in Italy, Fiasconaro's share is stronger, accounting for **8% to 10%** of the artisanal segment, reflecting the brand's deep resonance with consumers who value authenticity and tradition.

Fiasconaro's strategic emphasis on **Sicilian heritage** has set it apart from competitors. By using local ingredients and flavors, the brand has cultivated a unique identity that appeals both to domestic and international consumers. High-profile collaborations, like those with Dolce & Gabbana, have also enhanced its luxury image, positioning Fiasconaro as a leader in the premium baked goods market.

Fiasconaro's success lies in its ability to meet growing consumer demand for products that blend traditional flavors with modern twists, appealing to a broad and diverse audience. The increasing association of panettone and colomba with gifting during the holiday season further contributes to market growth, providing additional revenue opportunities.

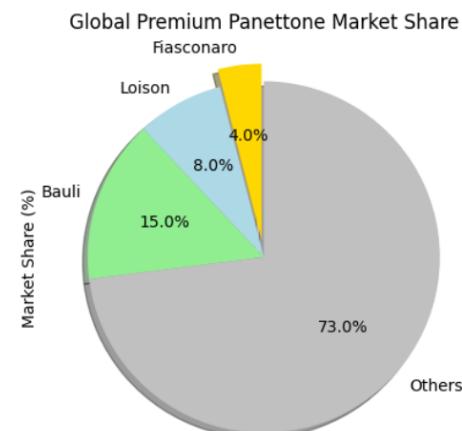


Figure 2.4: *Global Premium Panettone Market Share.*

## 2.2 Seasonal and Off-Season Dynamics

### 2.2.1 Seasonality

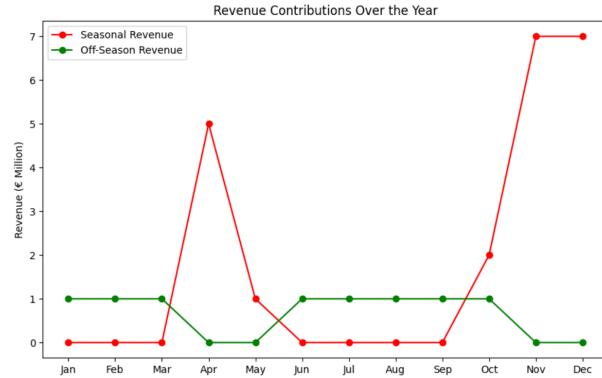


Figure 2.5: *Revenue Distributions Over the Year.*

As we will further discuss in Chapter 3, Fiasconaro's revenue distribution is heavily influenced by seasonality. The months between **November and December** are crucial, generating approximately **70% of annual revenue**, or about **€14 million**, primarily from panettone sales. This seasonal spike reflects the cultural association of panettone with Christmas. Similarly, colomba sales peak around **Easter**, contributing an additional **25%-30% of annual revenue (€5-6 million)**.

This seasonal demand creates logistical challenges, requiring careful production scaling and inventory management. However, Fiasconaro's ability to efficiently manage these peaks while maintaining product quality has been key to its market leadership. These dynamics also highlight the risks associated with a concentrated revenue cycle, making it crucial for Fiasconaro to continue diversifying and exploring opportunities for growth in off-season periods.

### 2.2.2 Off-Season Innovations

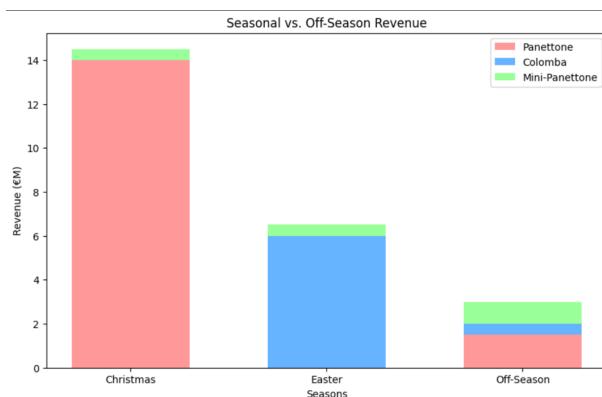


Figure 2.6: *Seasonal vs Off-Seasonal Dynamics with Off-Season Innovations.*

To address the challenges of seasonality and reduce its dependency on peak holiday periods, Fiasconaro has introduced a range of innovative products designed for **year-round consumption**. One of the most notable innovations is the **mini panettone**, which is priced at **€10-€15 per unit** and caters to consumers seeking a smaller, more affordable version of the classic treat. This product, along with other smaller gourmet items, contributes approximately **5%-10% of total revenue**, equivalent to **€1-2 million**. These offerings are particularly appealing to consumers who want to enjoy premium baked goods outside traditional festive seasons.

Fiasconaro's commitment to diversifying its product portfolio is not only a strategy to mitigate seasonal risks but also a re-

sponse to evolving consumer preferences. By creating smaller, more accessible products, the company is able to tap into the growing demand for artisanal snacks that can be enjoyed on casual occasions. This off-season segment holds significant potential for growth, with projections suggesting it could expand by **15%-20% annually**. Over time, this could add up to **€3 million** in incremental revenue, further stabilizing the company's financial performance and reducing reliance on seasonal peaks.

## 2.3 Production Cycle Analysis

The production of Fiasconaro's panettone and colomba relies on a meticulous and traditional process featuring natural sourdough starters and extended fermentation periods of **36 to 48 hours**, ensuring premium quality but limiting production speed. Annually producing about **500,000 units**, the operation balances high output with artisanal craftsmanship, incurring significant costs for premium Sicilian ingredients (**€6-8 million annually, 30-40% of expenses**) and skilled labor (**€4 million annually, 20% of revenue**). Fiasconaro's production process also requires stringent quality control measures to preserve the authenticity of its traditional recipes.

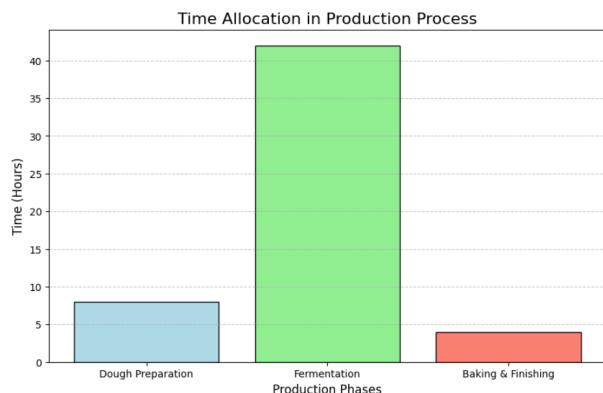


Figure 2.7: *Production Process.*

Cost Breakdown in Production Metrics

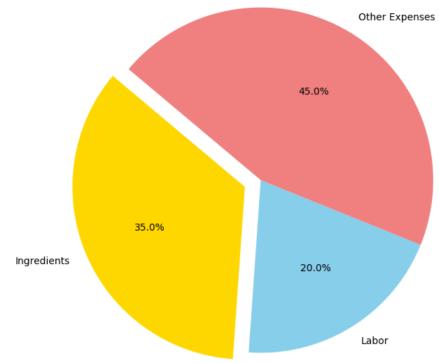


Figure 2.8: *Cost Breakdown In Production Metrics.*

## 2.4 Competitor Benchmarking and Positioning

In the panettone sector, particularly for Fiasconaro, competition can be divided into two key categories: **indirect competitors** and **direct competitors**. **Indirect competitors**, such as *Balocco* and *Bauli*, target a broader audience by focusing on mass production rather than artisanal craftsmanship. These companies emphasize accessibility and affordability, offering products that appeal to a wide consumer base.

In contrast, **direct competitors** operate within the same high-end artisanal segment as Fiasconaro, targeting discerning customers who prioritize quality, tradition, and innovation. Notable direct competitors include **Iginio Massari**, known for its luxury patisserie; **Pasticceria Olivieri 1882**, which emphasizes its long-standing heritage; **Dolciaria Loison**, renowned for its elegant packaging and gourmet flavors; **Pasticceria Bonci**, which highlights

regional authenticity; and **Pasticceria Davide Longoni**, which blends artisanal methods with a contemporary approach.

### Fiasconaro's Positioning

Fiasconaro occupies a distinctive place within the high-end artisanal panettone market, carving out a niche defined by its **strong Sicilian identity**. The company distinguishes itself through a unique blend of **tradition and innovation**, reinterpreting the classic panettone recipe with flavors and ingredients rooted in Sicilian culture.

This approach enables Fiasconaro to offer a product that is both authentic and innovative, setting it apart from competitors who may focus solely on tradition or innovation. Collaborations with brands such as Dolce & Gabbana further reinforce its positioning in the **luxury artisanal segment**, solidifying its status as a benchmark for excellence in this market. By emphasizing premium quality, cultural heritage, and creative reinterpretation, Fiasconaro appeals to consumers seeking a product that transcends the conventional boundaries of panettone.

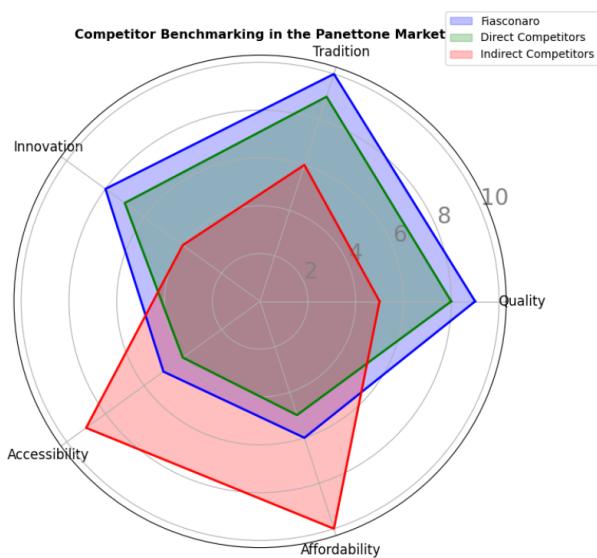


Figure 2.9: Competitor Benchmarking

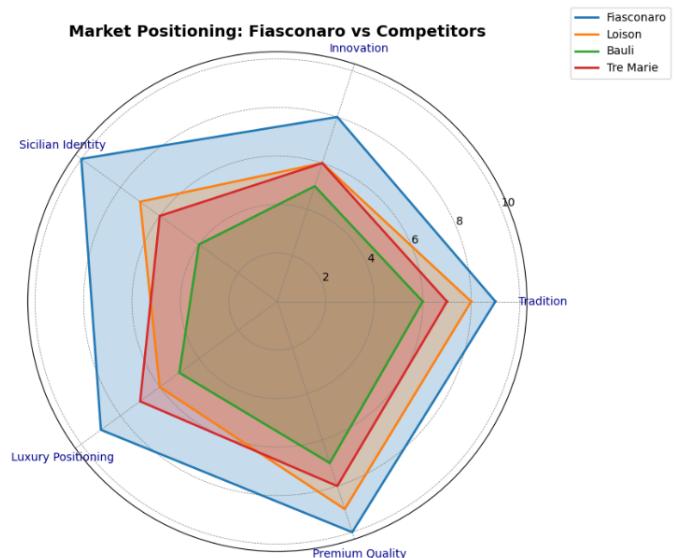


Figure 2.10: Fiasconaro vs Competitors

#### 2.4.1 The Gartner Quadrant

The Gartner Quadrant analyzes competitors based on **completeness of vision** (strategic innovation, branding, and collaborations) and **ability to execute** (product quality, distribution, and reputation). Fiasconaro excels in both dimensions, leveraging innovative reinterpretations of traditional recipes and strong operational excellence. This positioning highlights its leadership in the luxury artisanal panettone market. The analysis helps identify direct competitors and areas for strategic refinement to maintain a competitive edge.



Figure 2.11: *Gartner Quadrants*

The four resulting categories and the main competitors are summarized in the following table.

Category	Competitors
<b>Leaders</b> <i>Competitors with high execution capability and a clear, innovative vision.</i>	<ul style="list-style-type: none"> <li><b>Iginio Massari:</b> Renowned for top-quality panettone, emphasizing craftsmanship and excellence.</li> <li><b>Pasticceria Olivieri 1882:</b> Limited production focused on boutiques and luxury stores.</li> </ul>
<b>Challengers</b> <i>Competitors with high execution capability but a less innovative vision.</i>	<ul style="list-style-type: none"> <li><b>Fiasconaro:</b> Known for large-scale artisanal production using Sicilian ingredients, with excellent quality and distribution.</li> </ul>
<b>Visionaries</b> <i>Competitors with a clear, innovative vision but lower execution capability.</i>	<ul style="list-style-type: none"> <li><b>Pasticceria Davide Longoni:</b> Focuses on ancient grains and sustainable methods but operates on a small scale.</li> </ul>
<b>Niche Players</b> <i>Competitors with limited execution capability and vision, often focused on specific market niches.</i>	<ul style="list-style-type: none"> <li><b>Dolciaria Loison:</b> Targets customers appreciating unique and refined luxury products.</li> <li><b>Pasticceria Bonci:</b> Emphasizes exclusivity and quality in the luxury market.</li> </ul>

Table 2.1: *Competitor Benchmarking and Positioning*

# Chapter 3

# Financial and Operational Assessment of Fiasconaro

This chapter provides an overview and financial assessment of the Fiasconaro business through the analysis of the financial statements sourced from the AIDA database. Specifically, we will analyze key *liquidity*, *current management*, *efficiency*, and *profitability* ratios over the period from 2014 to 2023, with a particular focus on the last three years, aiming to identify the primary drivers of the company's performance.

## 3.1 Comprehensive Financial Ratio Analysis

In this paragraph we start the analysis of the different ratios.

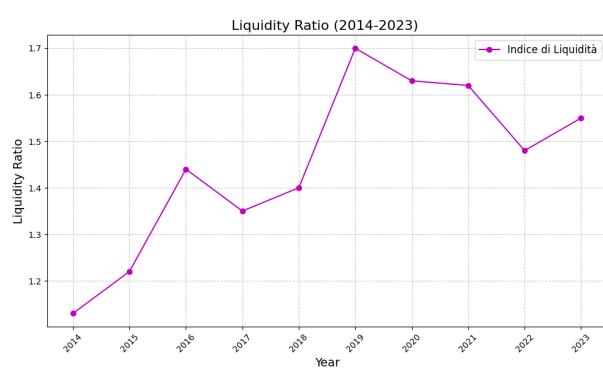


Figure 3.1: *Liquidity Ratio*.

The **Liquidity Ratio** (Figure 3.1) reflects the company's ability to meet its short-term obligations using current assets. The trend over the years indicates moderate liquidity, suggesting that while the company can generally cover its obligations, it may face difficulties under adverse conditions. This was evident in 2022, when the liquidity ratio experienced a significant downturn due to the Ukraine-Russia conflict, which led to increased raw material costs. Despite this temporary challenge, the company demonstrated resilience, with the ratio stabilizing at 1.55 in 2023. The growth from 1.13 in 2014 to 1.55 in 2023 highlights consistent improvements in financial management and a stronger liquidity position over time, even amid external disruptions such as the pandemic. The stability observed in recent years underscores the **effectiveness of the company's strategies in navigating financial and operational challenges**. A liquidity ratio above 1 is a positive indicator, demonstrating that current assets exceed liabilities. Nevertheless, the improvement in liquidity has been incremental, suggesting only modest progress

management and a stronger liquidity position over time, even amid external disruptions such as the pandemic. The stability observed in recent years underscores the **effectiveness of the company's strategies in navigating financial and operational challenges**. A liquidity ratio above 1 is a positive indicator, demonstrating that current assets exceed liabilities. Nevertheless, the improvement in liquidity has been incremental, suggesting only modest progress

in financial management.

The **Current Ratio** measures a company's ability to cover short-term liabilities with its current assets, including less liquid ones such as inventory. From 2015 to 2019, an upward trend indicated growth and operational efficiency, likely driven by successful strategies or market expansion. However, the decline and subsequent stabilization around 1.67 in 2022 reflect the impact of the COVID-19 pandemic and potential market saturation.

The **Debt/Equity (D/E) ratio** measures the proportion of debt financing relative to shareholders' equity, offering insights into a company's financial leverage and risk profile. For Fiasconaro, the data reveals a significant reduction in the D/E ratio from 1.02 in 2014 to 0.11 in 2023, with notable stability from 2019 onward. This trend suggests a deliberate effort to reduce reliance on external debt, likely reflecting improved financial management, greater reinvestment of profits, or a strategic decision to maintain low financial risk. It signals a strong equity base, financial stability, and reduced vulnerability to interest rate fluctuations or economic downturns.

The **Net Financial Position (NFP)** (Figure 3.2) transitioned from a positive value in 2014 (€1,735,567) to a negative value in 2023 (-€4,973,505), reflecting a significant shift in the company's financial standing over the past decade. The **sharp decline between 2014 and 2016** indicates a rapid *increase in financial liabilities* or a substantial *decrease in liquid assets*. From **2016 to 2019**, the NFP **stabilized** somewhat, showing smaller fluctuations. However, **starting in 2020**, the position **deteriorated** further, reaching its **lowest point in 2021** (-€6,765,034), likely due to external challenges such as the COVID-19 pandemic. A slight **recovery** was observed **in 2022** (-€3,227,414), which may reflect improved management of financial liabilities. However, the subsequent **decline in 2023** (-€4,973,505) suggests that the company continues to face financial pressures, potentially linked to broader economic or industry-specific challenges. Overall, the company's Net Financial Position has shown a clear downward trend, shifting from a surplus in 2014 to a deficit in 2023. While the recovery seen in 2022 is encouraging, the increasing reliance on debt underscores ongoing financial risks that require careful management.

The **EBITDA/Sales ratio** measures the proportion of earnings before interest, taxes, depreciation, and amortization (EBITDA) relative to sales, indicating a company's operational efficiency and profitability. For Fiasconaro, this ratio fluctuated between 13.63% in 2015 and a peak of 19.70% in 2021, demonstrating a strong ability to convert sales into operational profits during those years. However, the sharp decline to 13.81% in 2022, followed by a recovery to 14.87% in 2023, highlights potential challenges in managing costs or maintaining margins amid market or operational pressures. Sustaining a healthy EBITDA/Sales ratio will be vital for reinvesting in innovation, enhancing product quality, and maintaining competitiveness in a premium market.

The **Return on Assets (ROA)** measures a company's ability to generate net income from its total assets, reflecting overall efficiency in utilizing resources to create value. For Fiasconaro, the ROA showed consistent performance

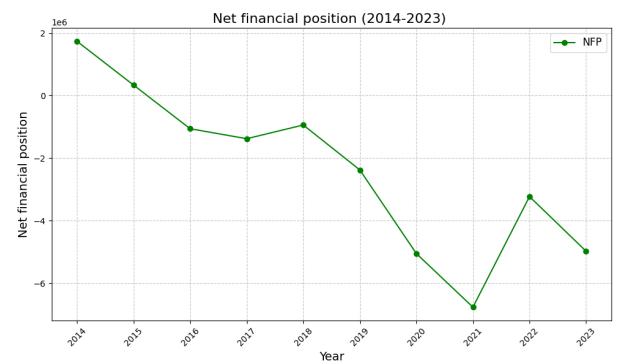


Figure 3.2: *Net Financial Position*.

above 12% between 2014 and 2019, peaking at 16.50% in 2019. However, a decline is observed from 2020 onwards, with the ratio falling to 11.22% by 2023, indicating reduced efficiency in leveraging assets for profitability.

The **Return on Equity (ROE)** measures a company's ability to generate profits from its shareholders' equity, reflecting how effectively it uses invested capital to create value. For Fiasconaro, the ROE showed strong performance in 2014 at 32.21%, followed by a gradual decline to 21.08% in 2018. A slight rebound to 24.45% in 2019 was offset by a significant drop to 15.02% in 2020. The ratio has since stabilized around 15.84% in 2023, though still below earlier peak levels. These trends highlight the company's initial high profitability relative to equity, followed by increasing challenges in maintaining that level of return.

### 3.2 Current Management Ratios and Historical Trend Analysis

In this paragraph we present the analysis of the **Current Management Ratios**, which are critical for assessing the company's ability to efficiently manage its short-term resources and obligations. These ratios provide insight into the operational health of the business, highlighting its capacity to meet immediate financial commitments, manage working capital effectively, and sustain day-to-day operations. Understanding these metrics is essential for evaluating the company's liquidity, solvency, and overall financial stability, which are vital for maintaining investor confidence and ensuring long-term growth.

**Invested Capital Rotation:** it measures how efficiently a company generates revenue relative to the capital invested in its operations. A higher ratio suggests more efficient use of capital. The rotation of invested capital displayed *moderate efficiency*, fluctuating between 0.75 and 1.15 during the period. After a decline in 2016 to 0.75, a gradual recovery followed, peaking at 1.15, before stabilizing between 1.02 and 1.06 in recent years. This trend reflects moderate success in generating revenues relative to the capital invested in operations. Periods of decline highlight opportunities to optimize asset utilization, while recent stabilization indicates steady progress in efficiency.

**Gross Circulating Capital Rotation:** it measures how efficiently a company uses its working capital to generate revenue (a higher ratio suggests better efficiency). This metric remained *relatively stable*, ranging from 1.49 to 1.67, except for a temporary dip to 1.26 in 2016. The overall consistency in this metric indicates stable management of gross circulating capital. The 2016 decline may point to temporary inefficiencies or external pressures but did not signal a lasting trend.

**Incidence of Operating Working Capital:** It measures the proportion of a company's revenue that is tied up in working capital. It essentially indicates how much of the company's revenue is being used to finance its day-to-day operations, rather than being available for other purposes, such as investing or paying down debt. A high incidence of working capital suggests that a significant portion of the company's resources is locked up in operational assets (e.g., inventory or receivables), which may reduce liquidity and financial flexibility. We can observe a *decreased* significantly from 19.20% in 2014 to 2.21% in 2021, demonstrating marked efficiency improvements. However, it rebounded slightly to 6.78% by 2023. The sharp reduction over time highlights improved management

of working capital relative to revenue, suggesting stronger operational discipline. The slight uptick in recent years may indicate renewed reliance on working capital, possibly due to shifts in market conditions or strategic investments.

**Receivables and Payables Management:** The company has made significant strides in optimizing its receivables and payables processes.

- **Receivables Duration (Gross of VAT):** it shows the average number of days it takes for the company to collect its receivables. A lower DSO (average days sales outstanding) indicates faster collection, improving cash flow. It decreased steadily from 170.57 days in 2014 to 104.81 days in 2022, with a slight increase to 119.90 days in 2023.
- **Payables Duration (Gross of VAT):** Payables duration, while fluctuating, remained relatively high, peaking at 191.16 days in 2017 and stabilizing around 162 days in recent years. A higher DPO (average days payable outstanding) suggests that the company is able to extend its payment terms, which can improve liquidity, but excessively high DPO may strain supplier relationships.

The shortening of receivables duration reflects improved cash collection efficiency, enabling the company to accelerate its cash inflows. Simultaneously, the sustained length of payables duration indicates effective negotiation with suppliers, allowing the company to optimize cash outflows and maintain liquidity.

To gain a deeper understanding of product management, we will now focus on the analysis of **Average Inventory** and the **Duration of Commercial cicle**.

These two metrics are essential for evaluating how effectively a company manages its inventory and cash flow. Both metrics are closely linked and critical for effective budgeting and financial planning. A well-managed inventory leads to reduced holding costs and improved cash flow, while an optimized commercial cycle enhances liquidity and financial flexibility. A shorter commercial cycle allows the company to free up cash faster, which can be reinvested into operations or used to cover short-term obligations, thereby improving financial stability.

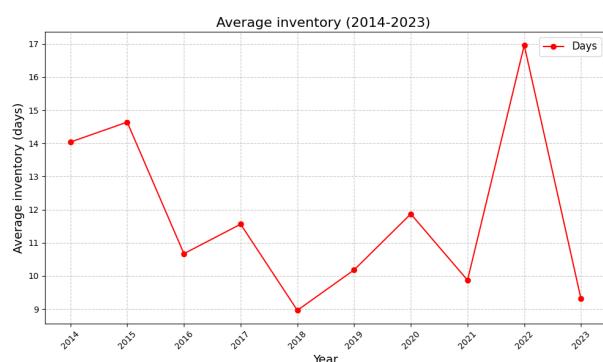


Figure 3.3: Avarage Inventory.

The **Average Inventory** (Figure 3.3 measures the average number of days a company takes to sell its inventory. It is a critical metric for assessing inventory turnover efficiency and overall operational effectiveness. A low value indicate a better inventory turnover efficiency and overall operational effectiveness.

Over the past decade, the company has significantly **improved** its **average inventory management**, reflecting strategic efforts to enhance efficiency. While external disruptions in 2020 and 2022, such as the COVID-19 pandemic and subsequent economic uncertainties, caused temporary inefficiencies, the rapid recovery in 2023 highlights the company's resilience and adaptability. The sharp **increase in inventory days in 2022** (16.96 days) likely resulted from overstocking due to supply chain constraints and economic

of working capital relative to revenue, suggesting stronger operational discipline. The slight uptick in recent years may indicate renewed reliance on working capital, possibly due to shifts in market conditions or strategic investments.

unpredictability, following a surge in demand for artisanal products in 2021 driven by post-pandemic consumer behavior. In contrast, the **low inventory days recorded in 2018** (8.96 days) showcase the success of lean inventory practices and just-in-time strategies implemented during this period. The steady *decline in average inventory days from 2014 to 2023 underscores the company's consistent focus on optimizing inventory turnover*, improving cash flow, and reducing holding costs. This trajectory, despite occasional disruptions, demonstrates the company's ability to adapt and maintain long-term efficiency through refined demand forecasting and supply chain management.

The **Duration of Commercial Cycle** (Figure3.4) measures the time required to *convert inventory into sales*, serving as an indicator of overall operational efficiency. Over the past decade, the company's performance in this area demonstrates a **significant evolution in working capital management strategies**. The shift to negative values after 2015 reflects improved efficiency, though recent fluctuations, particularly in 2021 and 2023, underscore persistent challenges that require attention to ensure financial stability. In **2014 and 2015**, positive values suggest a reliance on external funding to bridge the gap between inventory purchases and cash collection from customers. From **2016 to 2018**, a notable transition to negative values indicates a strategic shift toward reduced dependence on external financing, showcasing improved operational practices. The period **between 2019 and 2021** reveals an increase in the cycle duration, followed by a sharp **decline in 2021**, likely driven by the COVID-19 pandemic. Disruptions during this time impacted supply chains, delayed receivables, and necessitated extended payment terms with suppliers to preserve liquidity. In the post-pandemic recovery phase, the **stabilization observed in 2022** (-6.72 days) reflects improved management of the commercial cycle. However, the substantial **drop in 2023** (-21.65 days) signals persistent challenges, potentially linked to rising operational costs, strained supplier relationships, and increased product prices, all of which warrant strategic interventions.

From the comparison we notice that while the decline in average inventory days over the past decade highlights improvements in inventory turnover and cost efficiency, the shift to negative values in the commercial cycle duration reflects enhanced liquidity management and reduced reliance on external financing. However, the recent fluctuations in both metrics, particularly in 2022 and 2023, underscore challenges such as rising operational costs, supply chain disruptions, and evolving demand patterns. These trends indicate a need for cohesive strategies that align inventory optimization with broader financial and supply chain objectives.

### 3.3 Outlook for 2024

As the company **moves into 2024**, it appears to be stabilizing following a challenging period marked by the COVID-19 pandemic, supply chain disruptions, and volatile demand. Key financial and operational indicators suggest significant progress in managing liquidity and optimizing inventory, reflecting resilience and adaptability after the disruptions experienced between 2020 and 2022.

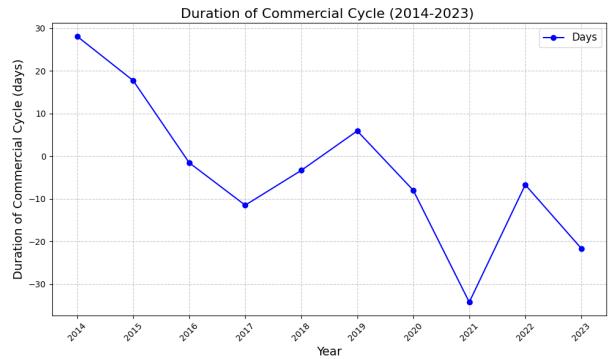


Figure 3.4: Duration of Commercial Cycle.

Nonetheless, the **Net Financial Position** remains negative, indicating the ongoing impact of increased debt incurred during the pandemic. Despite this, improvements in the **Commercial Cycle** and **Average Inventory** metrics point to enhanced cash conversion efficiency and more effective inventory management, signaling a positive trajectory.

Looking ahead, the company is expected to prioritize streamlining working capital, strengthening supplier and creditor relationships, and refining inventory strategies to ensure smoother operations in the post-pandemic landscape. If current trends persist, 2024 could see further recovery in profitability, although addressing the elevated debt burden will be critical for achieving long-term financial sustainability.

In summary, from 2014 to 2023, the company has successfully navigated a series of external and internal challenges, demonstrating notable progress in liquidity management, inventory optimization, and operational efficiency. However, financial leverage remains an area of concern. For 2024, the focus will likely remain on improving operational effectiveness while reducing financial stress, supporting a continued path toward stability and growth.

# Chapter 4

## AI-Driven Forecasting and Budgeting for Fiasconaro

After conducting a comprehensive analysis of the business and market in previous chapters, highlighting the need for more effective management to enhance overall company performance, this chapter will focus on why **Fiasconaro should consider adopting AI technologies** based on our findings.

### 4.1 Enhancements to Financial Processes Through AI

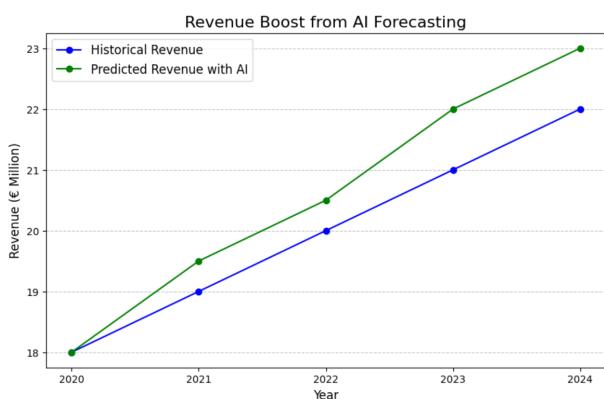


Figure 4.1: Revenue from AI Forecasting.

To improve operational efficiency and effectively manage the complexities of a seasonally driven business, Fiasconaro should integrate advanced AI-powered forecasting tools and analytics. These systems leverage data from multiple sources, including historical sales trends, seasonal patterns, and weather conditions, to deliver precise demand forecasts. This approach can help the company mitigate overproduction risks, such as excess inventory and waste, while ensuring adequate capacity to meet peak demand during critical periods.

AI-driven forecasting also enables real-time operational adjustments, encompassing labor scheduling, raw material procurement, and inventory management. During off-seasons,

such tools can optimize operations, reducing costs and improving overall efficiency. By adopting this proactive strategy, Fiasconaro could potentially increase annual revenue by an estimated **€1 million** by minimizing resource wastage and streamlining production cycles. Integrating advanced analytics into decision-making processes would not only enhance competitiveness but also bolster the company's ability to respond to evolving demands in the premium baked goods market.

The production of panettone and colomba, Fiasconaro's flagship products, faces unique challenges due to the seasonal availability of high-quality ingredients such as Sicilian citrus and almonds. These ingredients are subject to fluctuations in supply and price, potentially disrupting production schedules and escalating costs. Ensuring a consistent supply while maintaining premium quality demands meticulous planning and collaboration with suppliers.

By adopting AI-driven forecasting tools, Fiasconaro can address these challenges more effectively. These tools can align production schedules with predicted demand, minimizing overproduction and waste, while optimizing inventory management to reduce storage costs during off-peak periods. This integration would allow Fiasconaro to adapt more seamlessly to seasonal variations, maintain its quality standards, and achieve greater operational efficiency year-round.

AI-powered tools enable comprehensive support for key aspects of financial planning and performance management. These enhancements can be categorized as follows:

### **Revenue Forecasting**

Revenue forecasting is a central activity for Fiasconaro, being specialized in seasonal products. AI plays a key role in identifying the main factors influencing sales, including seasonal trends and regional preferences. By analyzing historical sales data combined with external factors like market dynamics and holiday schedules, detailed forecasts can be generated. These predictive models not only estimate future revenue but also provide confidence intervals that enable strategic planning based on realistic and diversified scenarios, supporting decision-making across multiple markets and product lines.

### **Demand Planning**

Demand planning is essential for optimizing production, minimizing waste, and meeting market needs during peak demand periods. Using AI, internal data from ERP systems can be integrated with external variables, such as raw material prices. This approach can allow Fiasconaro to anticipate demand fluctuations and effectively plan resource allocation, especially during production peaks such as the Christmas season. By aligning production schedules with market expectations, the company can improve operational efficiency and respond quickly to customer requirements.

### **Raw Material and Energy Cost Analysis**

Managing volatile raw material and energy costs is a critical challenge for an artisanal business. Artificial intelligence provides advanced tools to monitor real-time prices of key ingredients like flour, butter, and sugar, as well as energy costs. By analyzing both historical and current data, AI can model scenarios that anticipate price increases or supply chain disruptions. This capability not only enables simulations of potential impacts on production costs but also enhances supplier negotiations by leveraging detailed market trend predictions. Such an approach strengthens cost management and increases the company's resilience to unexpected fluctuations.

## Cash Flow Forecasting

Cash flow forecasting is a critical element in ensuring the financial sustainability of the business, particularly in a highly seasonal context. By leveraging AI, large datasets can be analyzed to identify periodic variations in expenses, such as those tied to increased production during festive months. Predictive models generate actionable insights that guide strategic decisions on capital investments or marketing campaigns, ensuring the company maintains financial stability even during periods of high operational intensity. This approach allows Fiasconaro to plan with greater confidence and flexibility, successfully navigating the challenges of seasonality.

## 4.2 Specific Drivers and KPIs for Fiasconaro

Starting from this section, we will delve into the core objectives of the project. Now, we will identify the specific drivers and fundamental KPIs for the company, addressing the following key questions:

- What drives sales figures?
- What drives costs?

To effectively manage and optimize the business operations of Fiasconaro, a clear **understanding** of its **key drivers** and **performance indicators** is essential. The table below (Table 4.1) highlights the **key business drivers**, which are the fundamental elements influencing the company's operational and financial outcomes. These drivers encompass factors such as *seasonal demand fluctuations*, *raw material* and *energy costs*, *logistics expenses*, and *evolving market trends*. Understanding these drivers allows the company to anticipate challenges, capitalize on opportunities, and strategically align its production, marketing, and distribution efforts.

Driver	Description
Seasonal Sales	Sales peaks during Christmas (panettone) and Easter (colomba).
Online Sales	The increasing use of digital platforms for purchasing premium seasonal products.
Raw Material Costs	Costs of essential ingredients such as flour, butter, sugar, and candied fruit.
Energy Costs	Seasonal fluctuations in energy consumption due to production demands.
Distribution Costs	Logistics expenses for delivering products to domestic and international markets.
Market Trends	Shifts in consumer preferences, particularly for artisanal and sustainable products.

Table 4.1: *Key Business Drivers*.

To successfully monitor and optimize Fiasconaro's business performance, it is crucial to track the key drivers discussed above. By understanding and managing these drivers, the company can gain insights into operational efficiencies, cost control, and revenue generation. However, simply identifying these drivers is not enough. It is equally important to establish key performance indicators (KPIs) that enable the company to measure progress, evaluate performance, and make informed decisions. KPIs provide a quantitative basis for understanding how effectively Fiasconaro is responding to the challenges and opportunities posed by each driver.

Below we outline key performance indicators (KPIs) and goals that support data-driven decision-making for

financial managers at Fiasconaro. Each KPI is aligned with specific business drivers such as seasonality, raw material costs, and market trends. For each driver, we provide an explanation of its importance, along with a list of relevant KPIs, including their descriptions and formulas.

## Seasonal Sales

Seasonal Sales is a critical driver for Fiasconaro, with peak sales during Christmas (panettone) and Easter (colomba). The KPIs below help monitor and optimize performance during these periods.

KPI	Description	Formula
Seasonal Sales Ratio	Percentage of total annual sales generated during Christmas (panettone) and Easter (colomba). Helps identify seasonal demand trends.	$\frac{\text{Seasonal Sales}}{\text{Total Annual Sales}} \times 100$
Seasonal Forecast Accuracy	Measures how closely forecasts match actual sales during peak seasons.	$1 - \frac{ \text{Forecasted Sales} - \text{Actual Sales} }{\text{Actual Sales}}$
Holiday Stockout Rate	Percentage of SKUs out of stock during seasonal sales peaks.	$\frac{\text{Stockouts During Peak}}{\text{Total SKUs}} \times 100$
Panettone Variety Units per Transaction	Measures the average number of units of different panettone types purchased in a single transaction, highlighting customer preferences for variety.	$\frac{\text{Total Units of Panettone Types Purchased}}{\text{Total Number of Transactions}}$

Table 4.2: *Seasonality KPIs.*

## Online Sales

The online sales channel is a growing and integral part of Fiasconaro's business strategy, with significant opportunities to expand reach and improve customer experience. Key performance indicators (KPIs) are essential for monitoring online sales performance and optimizing marketing, logistics, and customer engagement strategies.

KPI	Description	Formula
Conversion Rate	Percentage of website visitors who make a purchase. Indicates the effectiveness of the online store in driving sales.	$\frac{\text{Number of Purchases}}{\text{Number of Website Visitors}} \times 100$
Average Order Value (AOV)	Tracks the average amount spent per transaction, helping assess upselling or bundling strategies.	$\frac{\text{Total Revenue from Online Sales}}{\text{Number of Online Transactions}}$

Table 4.3: *Online Sales KPIs.*

## Raw Material Costs

The cost of essential ingredients, such as flour, butter, and candied fruit, can significantly impact profitability.

Monitoring raw material costs is crucial to maintaining a healthy margin.

KPI	Description	Formula
Cost per Unit of Key Ingredients	Tracks the average cost of essential ingredients (e.g., flour, butter). Helps in budgeting raw material expenses.	$\frac{\text{Total Ingredient Cost}}{\text{Quantity Purchased}}$
Raw Material Cost Percentage	Proportion of total production costs attributed to raw materials. Useful for understanding cost structure.	$\frac{\text{Raw Material Costs}}{\text{Total Production Costs}} \times 100$
Supplier Cost Variability Index	Tracks cost variability across suppliers. Helps identify stable and cost-effective sourcing options.	Standard Deviation of Supplier Costs

Table 4.4: *Raw Material Costs KPIs*.

## Energy Costs

Energy costs fluctuate with seasonal production demands. The KPIs below monitor energy efficiency and costs, enabling better optimization during high-demand periods.

KPI	Description	Formula
Energy Cost per Unit Produced	Average energy cost incurred to produce one unit of panettone or colomba.	$\frac{\text{Total Energy Cost}}{\text{Total Units Produced}}$
Energy Efficiency Ratio	Measures production output per unit of energy consumed. Useful for optimizing energy usage.	$\frac{\text{Units Produced}}{\text{Total Energy Consumed (kWh)}}$
Seasonal Energy Cost Variance	Tracks changes in energy costs between peak and non-peak production periods.	$\frac{\text{Peak Energy Cost} - \text{Non-Peak Energy Cost}}{\text{Non-Peak Energy Cost}} \times 100$
Renewable Energy Utilization Rate	Percentage of energy sourced from renewable sources during production. Useful for sustainability goals.	$\frac{\text{Renewable Energy Used}}{\text{Total Energy Used}} \times 100$

Table 4.5: *Energy Cost KPIs*.

## Distribution Costs

Efficient logistics are critical for Fiasconaro's distribution across 70 countries. The KPIs below measure cost-effectiveness and delivery efficiency.

KPI	Description	Formula
Cost per Unit Delivered	Tracks the average cost to deliver a single unit of panettone. Useful for optimizing logistics expenses.	$\frac{\text{Total Distribution Costs}}{\text{Total Units Delivered}}$
On-Time Delivery Rate	Percentage of orders delivered on or before the expected delivery date. Reflects distribution efficiency.	$\frac{\text{On-Time Deliveries}}{\text{Total Deliveries}} \times 100$
International vs. Domestic Shipping Cost Ratio	Compares average shipping costs for international and domestic markets.	$\frac{\text{Average International Shipping Cost}}{\text{Average Domestic Shipping Cost}}$

Table 4.6: *Distribution Costs KPIs*.

## Chapter 5

# Our Data-Driven Forecasting and Budgeting Software

In this chapter, we present our innovative solution to the challenges faced by Fiasconaro: the **Data-Driven Forecasting and Budgeting Software**. Installed on the financial manager's computer, this intuitive application integrates all critical financial and market variables into a single platform, simplifying decision-making and streamlining the budgeting process.

The software addresses the complexity of managing diverse financial accounts, drivers, and forecasts by offering an organized, user-friendly interface supported by advanced AI-driven tools. With real-time forecasting, AI-assisted decision-making, and dynamic KPI monitoring, our platform ensures that managers have a clear and actionable understanding of the company's financial health, market position, and future trends.

The following sections outline the key features of the software and its core functionalities, supported by mockup figures that illustrate its design and purpose.

## 5.1 Core Features and Functionalities

### 5.1.1 Central Dashboard: A Comprehensive Overview

The central dashboard (Figure 5.1) serves as the starting point for the financial manager, offering an at-a-glance view of the company's current situation. Key metrics such as revenue, costs, and market trends are displayed in customizable widgets. These widgets can be tailored to focus on the most relevant data for the user, ensuring efficiency and clarity.

The dashboard also integrates alerts generated by the AI assistant, notifying users of significant changes in forecasts, deviations in budget targets, or market disruptions.

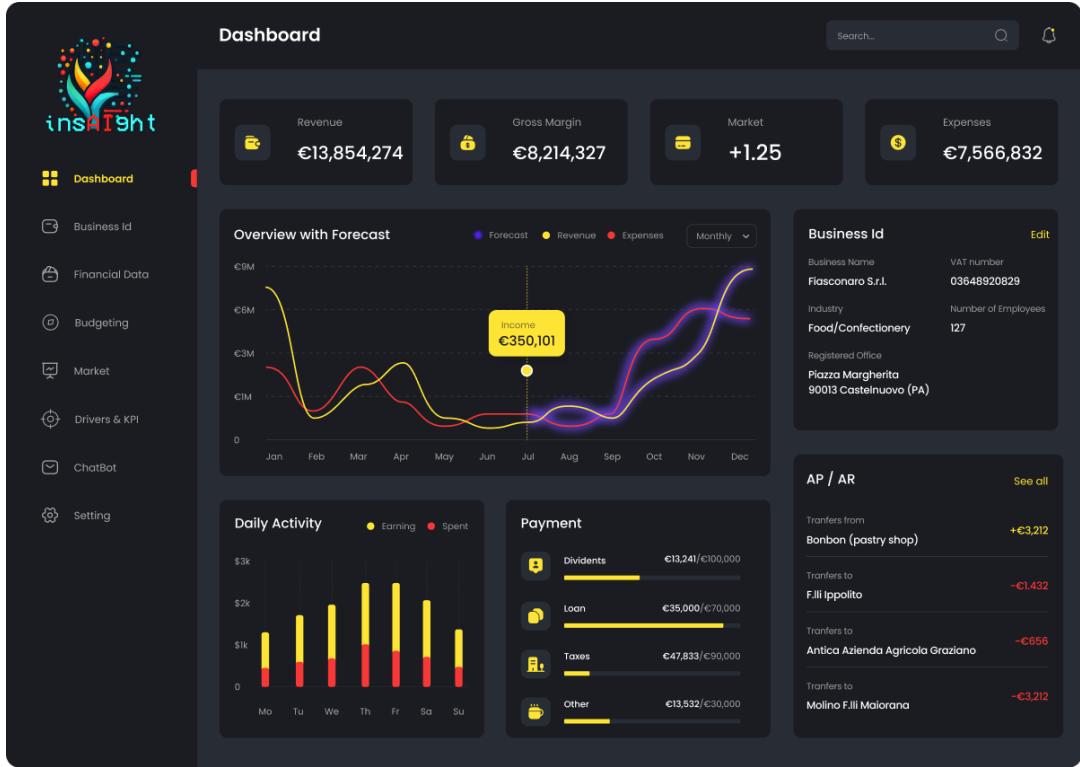


Figure 5.1: Central dashboard interface.

### 5.1.2 Budgeting Tool: Real-Time Forecasting and Planning

At the heart of the software is the budgeting tool (Figure 5.2), which simplifies the complex process of creating and refining financial plans. The tool allows manual entry of financial statements while integrating real-time market trend forecasts, including changes in average prices for key products such as panettone and colomba.

Additionally, the AI model analyzes historical data and external variables, enabling the financial manager to create realistic projections. This is enhanced by a **driver-based budgeting system**, where specific business drivers—key variables influencing the business—can be defined and weighted. The AI model can also suggest and derive drivers using correlation analysis, ensuring that all critical factors are considered.

### 5.1.3 Market Overview: Tracking Trends and Price Dynamics

The market overview screen (Figure 5.3) provides a comprehensive analysis of trends and price changes that impact Fiasconaro's products and operations. Average prices for panettone and colomba are displayed alongside raw ingredient price ratios for essentials like flour, almonds, and pistachios.

This feature ensures that managers can account for external cost fluctuations when preparing forecasts or making strategic adjustments. Predictive analytics within this tool anticipates market changes, helping the company remain competitive.

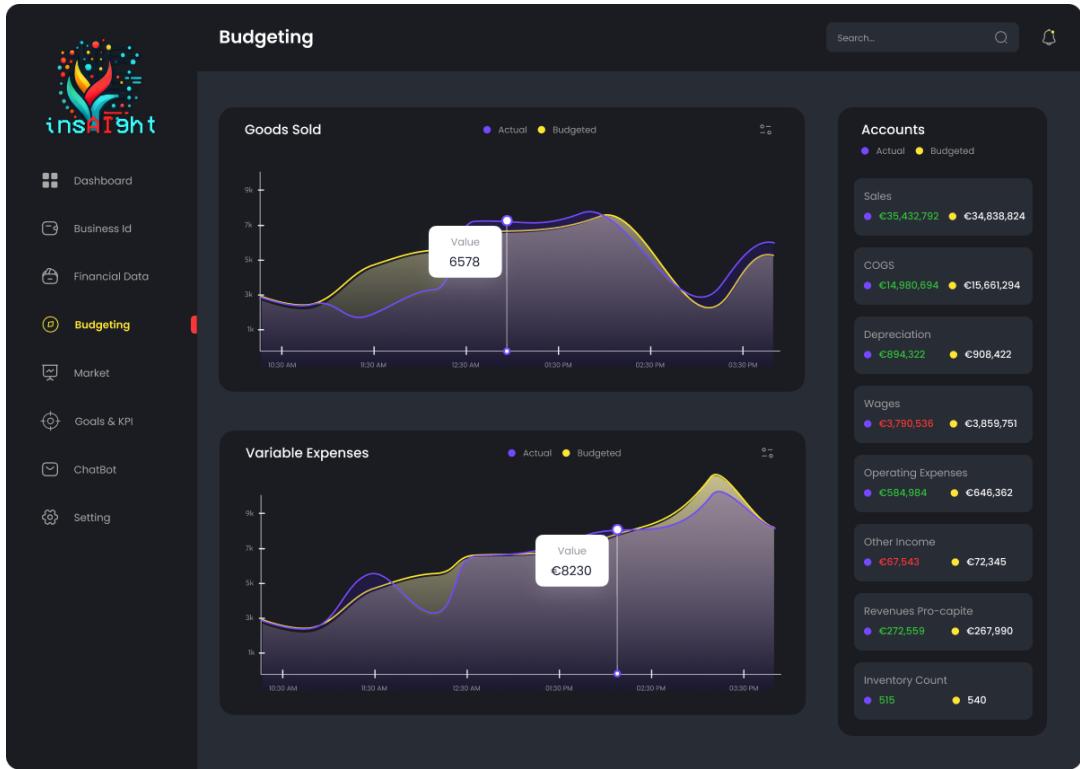


Figure 5.2: *Budgeting screen with real-time forecasting.*

### 5.1.4 Drivers and KPIs: Monitoring Performance and Correlation

This section (Figure 5.4) allows users to define and track the business drivers and KPIs most relevant to Fiasconaro's success. Drivers can be entered manually by the financial manager or derived using the AI model, which performs correlation analysis to identify key factors influencing financial outcomes.

The software also provides KPI monitoring tools, offering insights into metrics such as revenue growth, inventory turnover, and profit margins. AI integration enhances this process by suggesting new KPIs or highlighting underperforming metrics, helping managers refine their strategies in real time.

### 5.1.5 AI Assistant: The Core of Innovation

The AI assistant (Figure 5.5) is the most innovative feature of the software, acting as a virtual analyst for the financial manager. This tool not only monitors all variables in the system but also provides actionable recommendations and scenario-based hypotheses. For instance, the AI assistant can answer questions such as:

- “What are the revenue projections for the next quarter?”
- “Why are sales for colomba decreasing?”

Additionally, the assistant generates graphs, explores alternative scenarios, and sends real-time notifications if significant deviations in budgeting, market trends, or forecasts are detected. By automating time-consuming analyses, the AI assistant allows managers to focus on strategic decision-making.

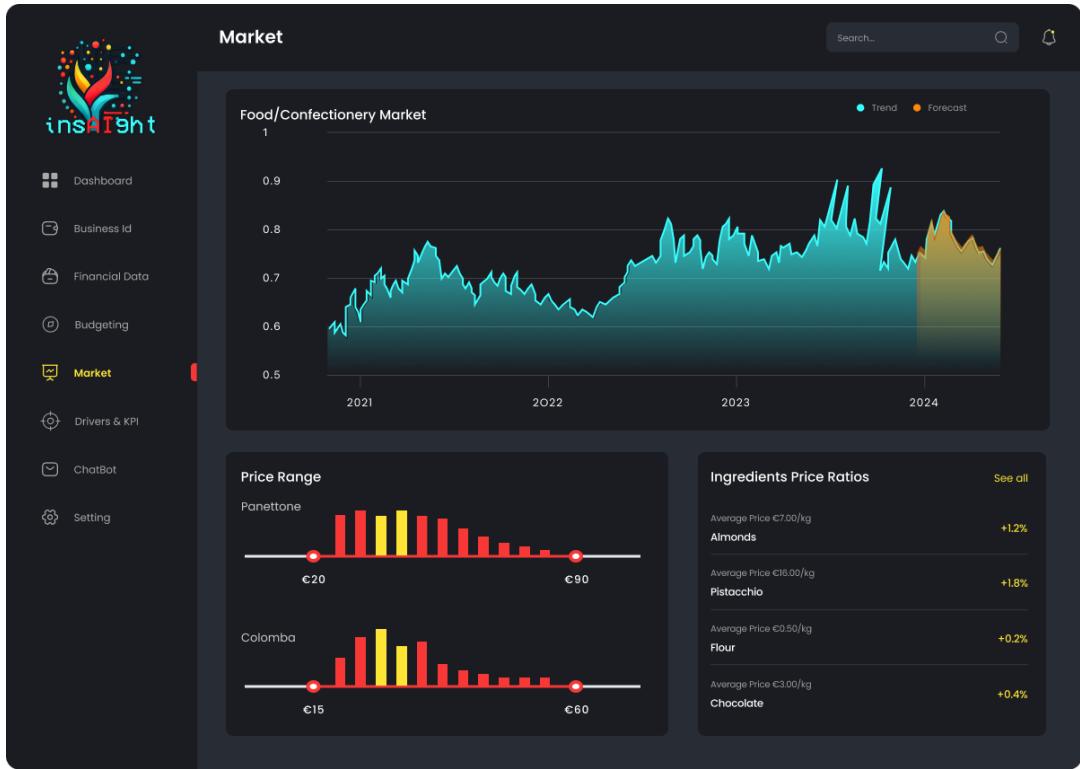


Figure 5.3: *Market overview with pricing trends and cost analysis.*

### 5.1.6 User-Friendly Design: Intuitive and Flexible

The software's intuitive design ensures ease of use, even for complex financial tasks. Its layout prioritizes accessibility, allowing financial managers to navigate seamlessly through dashboards, budgeting tools, and market analysis screens.

Customization is a key aspect: users can personalize dashboards, define the drivers and KPIs they wish to focus on, and integrate the software with external accounting systems or ERP tools. The platform is also mobile-friendly, ensuring that critical updates and insights are accessible anytime, anywhere.

## 5.2 Technical Architecture

Before diving into the specifics of our software architecture, it is essential to highlight that this system is designed to stand out for its **efficiency, precision, and rapid implementation**. Thanks to a robust technical foundation, it delivers high performance and reliability, significantly reducing operational complexities and analysis times.

Our architecture is structured around some fundamental layers that form the backbone of our solution:

### Data Layer

This layer collects and integrates internal data, such as financial statements, with real-time external data obtained from market APIs. This seamless integration allows the system to construct a dynamic and comprehensive information base, ready for immediate and accurate analyses. With flexible connectors and a modular design, the Data Layer

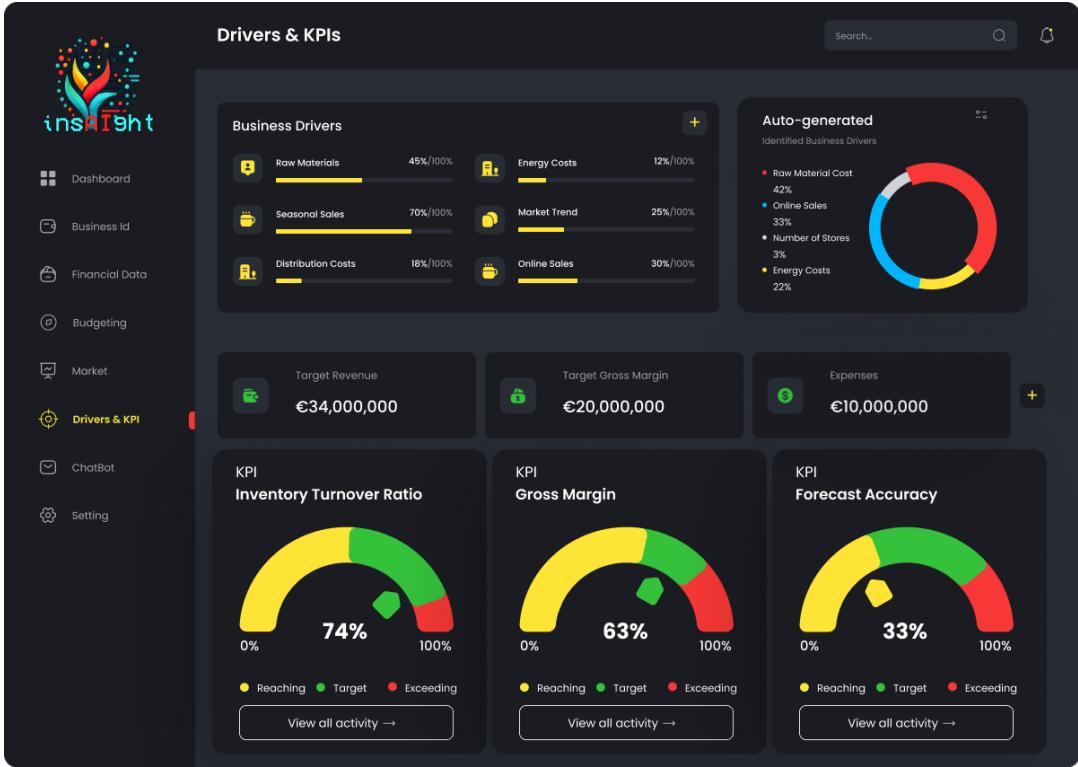


Figure 5.4: *Drivers and KPIs* interface.

ensures that businesses can adapt quickly to evolving data input requirements without significant reconfiguration.

## Data Storage

For data management and processing, we leverage robust technologies such as **MySQL** for structured data and modern tools like **Kafka** to handle streaming data flows. This hybrid approach combines stability and agility, enabling real-time responsiveness to emerging trends. By employing distributed data processing, the system provides unparalleled reliability, scalability, and speed, ensuring that businesses can act on market changes with confidence.

The core of our system lies in its advanced Artificial Intelligence capabilities and user-friendly interface. These layers enable businesses to transform raw data into actionable insights seamlessly.

## AI/ML Layer

We have integrated cutting-edge predictive models, such as **SARIMA**, to capture trends and seasonality with high accuracy. Additionally, **Monte Carlo simulations** allow for the evaluation of complex scenarios, helping businesses manage uncertainty and make more informed decisions. These technologies are designed not only to improve the accuracy of forecasts but also to optimize key operations, such as inventory management and financial planning. By automating complex analytics, the AI/ML Layer ensures quick and effective results.

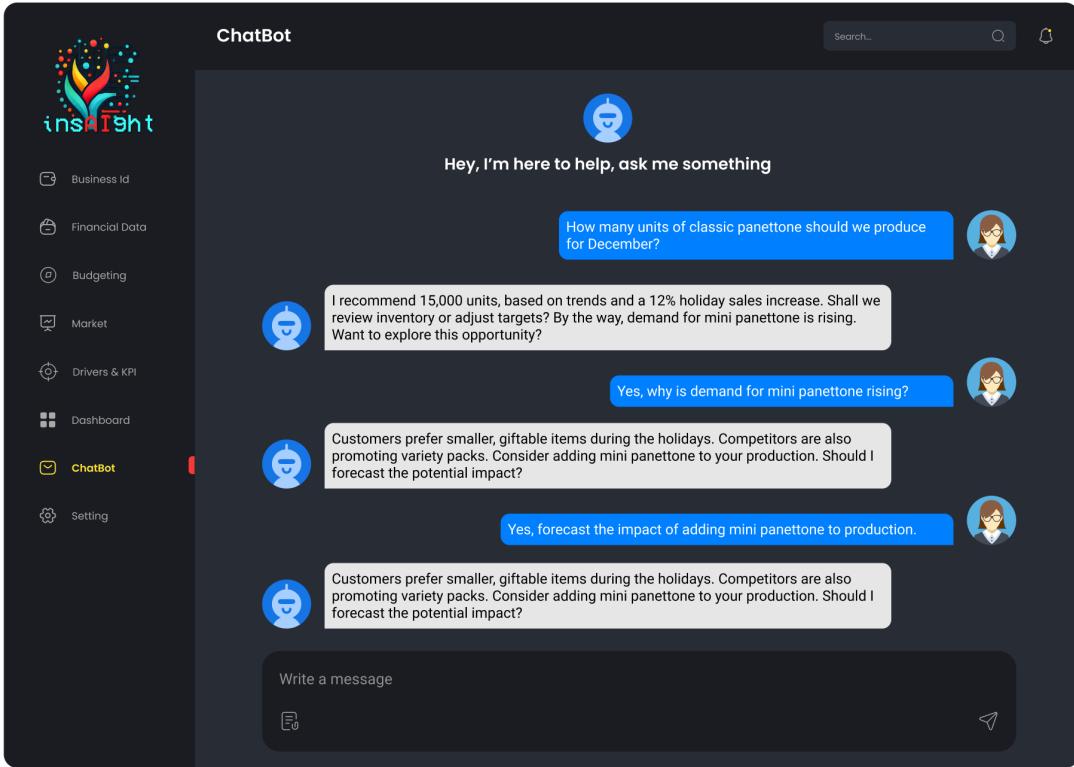


Figure 5.5: Example interaction with the AI assistant.

## Chatbot Layer

Our chatbot, powered by **Natural Language Processing (NLP)** frameworks such as **OpenAI API** and **LangChain**, is more than an assistant; it is a decision-making tool. It delivers detailed reports, responds to natural language queries, and enables on-demand simulations. This advanced level of interactivity ensures that the system is accessible to all users without requiring extensive technical training. The chatbot acts as a bridge between complex analytics and business users, empowering decision-makers with actionable insights at their fingertips.

Our architecture is designed to be **powerful, secure, and scalable**, ensuring immediate results and long-term adaptability.

## Application Layer

With a frontend developed using **React.js** and **Chart.js**, the system provides an intuitive interface with dynamic and interactive visualizations, simplifying even the most complex analyses. The backend, built with **REST API**, facilitates seamless integration with existing enterprise infrastructures. This streamlined architecture minimizes setup times and ensures a smooth user experience.

## Security Layer

Security is a top priority. We implement advanced encryption protocols such as **TLS** and **AES**, safeguarding data both in transit and at rest. The Security Layer ensures compliance with industry standards, offering businesses peace

of mind that their sensitive information is always protected.

## Deployment Layer

Scalability is supported by leading cloud providers such as **AWS** and **Azure**, allowing businesses to expand without worrying about infrastructure limitations. This cloud-native design ensures that resources can scale dynamically based on demand, providing flexibility and cost-efficiency. Additionally, continuous monitoring and automated updates guarantee high availability and resilience.

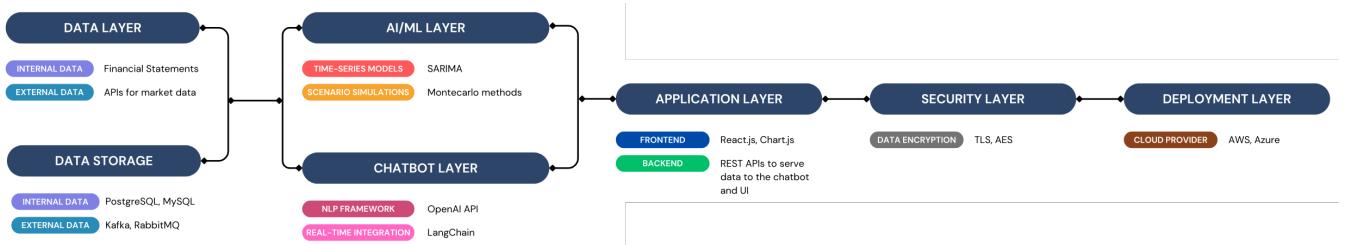


Figure 5.6: Technical Architecture Diagram

## 5.3 Implementation Timeline

The implementation of the data-driven forecasting and budgeting software follows a structured and systematic process to ensure seamless deployment and optimal functionality.

It begins with the **Planning and Analysis phase**, lasting one month, where requirements are gathered through stakeholder meetings, and the project scope is clearly defined. This foundational step ensures alignment with business needs and sets the stage for successful execution.

The **Algorithm Development phase** spans three months and involves creating and training machine learning models tailored for demand forecasting and other predictive analyses. These models form the backbone of the software's ability to deliver accurate and actionable insights.

Following this, the **User Interface and UX Design phase**, lasting two months, emphasizes crafting intuitive dashboards, reports, and user interactions. The goal is to enhance usability and accessibility for all stakeholders.

The **Software Development phase**, which requires four months, represents the most intensive and critical portion of the implementation timeline. During this phase, the software's architecture and core functionalities are built and integrated.

In the subsequent **Testing and Refinement phase**, lasting one month, the system undergoes rigorous unit testing and user acceptance testing. Any identified bugs are fixed, ensuring that the software meets both functional and performance expectations.

The **Deployment and Training phase**, also one month long, involves rolling out the software to end-users and conducting comprehensive training sessions to familiarize them with the system's features and capabilities.

Finally, **Post-Deployment Support** is an ongoing phase where the focus shifts to providing maintenance, software updates, and user support. This ensures the system remains reliable and continues to meet evolving business needs.

## 5.4 Why Fiasconaro Should Choose Our Solution

Our **Data-Driven Forecasting and Budgeting Software** offers a seamless, intuitive, and graphically appealing solution to the challenges of financial planning and market analysis. By integrating real-time forecasting, AI-driven insights, and customizable dashboards into a single, user-friendly platform, it simplifies complex financial processes and enhances decision-making.

This software empowers Fiasconaro's managers with actionable insights, improved forecast accuracy, and proactive alerts, making it a highly effective tool for budgeting and demand planning. Designed to be both practical and visually intuitive, it ensures that all critical data is accessible at a glance, providing the clarity and efficiency needed for sustainable growth in today's fast-paced market.

# Chapter 6

## *Proof of Concept:* forecasting and budgeting for 2024

In this chapter, we present a practical demonstration of our software, introduced in Chapter 5, utilizing the data gathered and analyzed in the first four chapters. The success of Fiasconaro's forecasting and budgeting relies on the effective integration of historical trends, seasonal patterns, and advanced forecasting models. To validate our approach, we developed a proof of concept that combines demand forecasting with dynamic budgeting for each quarter of 2024. Leveraging the SARIMA model, we illustrate how predictive analytics can be translated into actionable financial strategies.

### 6.1 Data Preparation: Quarterly Sales and Inventory Breakdown

To ensure unbiased and reliable forecasts, we focused on the most recent three years of available data: **2021**, **2022**, and **2023**. Although only annual figures were accessible from the AIDA database, we simulated quarterly details to align with Fiasconaro's seasonal sales patterns.

These assumptions were based on historical performance and general market trends, with key periods identified as Christmas (Q4) and Easter (Q1/Q2), which are critical drivers of Fiasconaro's revenue. This approach allowed us to capture the seasonality essential for accurate forecasting.

Quarter	Months
Q1	January - February - March
Q2	April - May - June
Q3	July - August - September
Q4	October - November - December

Table 6.1: *Quarterly Breakdown of Months*

To account for seasonality, we identified the dates of key holidays, specifically Easter, which varies each year (as showed in 6.2, and Christmas, which consistently falls on December 25. This approach ensures a more precise and relevant analysis.

	<b>2021</b>	<b>2022</b>	<b>2023</b>
<b>Easter</b>	April 4 <sup>th</sup>	April 17 <sup>th</sup>	April 9 <sup>th</sup>

Table 6.2: *Dates of Easter for the years 2021, 2022, and 2023.*

We now account for the division into quarters year by year for both **sales** and **inventory**.

## 2021 Quarterly Sales Breakdown

As discussed in previous chapters, this year experienced a notable increase in sales. This growth is evident both in our company's performance and in the general market sales of *panettone* during the Christmas season. Based on this trend, we have estimated that **more than half of the total** sales occurred in Q4 → **Q4 = 55%**. We then analyzed another major revenue stream for *Fiasconaro*: the sale of colombe during the Easter season. While April falls within Q2, we assumed that most sales occur prior to the holiday, placing them in Q1. Additionally, considering potential sales tied to the previous year's Christmas season, we estimated **Q1 = 27%**. Through extensive online research, we found that, although minimal, some sales occur during the summer months. These are primarily driven by opportunities for visitors to tour the company and the sales of *mini-panettone*. Based on this, we estimated **Q3 = 7%**. For the remaining period, we were forced to estimate **Q2 = 10 %**, which aligns with our analysis. This slightly higher percentage compared to the summer period reflects the influence of *Easter* sales during Q2.

## 2022 Quarterly Sales Breakdown

During this year, as noted in the previous chapters, we observed a considerable decline in performance compared to the previous year. Building on this observation and considering that the majority of activities typically occur during the Christmas season, we estimated **Q4 = 48%**. In 2022, Easter fell at the end of April, leading to increased activity during the second quarter. Based on this, we estimated **Q2 = 18 %**. Additionally, 2022 saw a rise in tourism across Italy, and particularly in Sicily, which resulted in an increased number of company tours and related activities during the summer months. Consequently, we estimated **Q3 = 10%**. Finally, we were forced to assigne **Q1 = 14%**, a figure that aligns with previous observations of increased activity in Q2. During Q1, we can still see the residual effects of the previous Christmas season and preparations for the upcoming Easter holiday. This explains why the percentage is not lower.

## 2023 Quarterly Sales Breakdown

During this year, we observed a general decline in performance compared to the previous year. However, according to the accompanying notes, the last quarter accounted for 10% more sales than the rest of the year combined. Building on this observation and considering that the majority of activities typically occur during the Christmas season, and

according with market search, we estimated **Q4 = 54%**. This year, we considered the Easter period to be similar to 2021. Based on the observations made so far, we have estimated **Q1 = 24%**. Taking into account an increase in tourism in Italy in 2022 compared to 2021, as well as maintaining observations from previous years (including the presence of tours), we have estimated **Q3 = 9%**. Lastly, we have assumed **Q2 = 13%**, which remains consistent with all the observations conducted to date.

## Quarterly Inventory Breakdown

Inventory management plays a critical role in operational efficiency, cash flow, and profitability. Unlike other financial indicators, inventory is directly influenced by factors such as demand variability, supply chain dynamics, and production cycles, which may not always align with broader financial trends. Therefore, it is essential to perform separate estimates for inventory to better understand its behavior and impact on the company's overall performance. This approach allows for more precise decision-making in areas such as stock optimization, procurement planning, and resource allocation.

Based on the data analyzed so far, we have concluded that inventory requires a separate and more detailed analysis compared to other financial metrics. For this reason, we have decided to conduct a more in-depth study. Specifically, we have estimated certain metrics, as shown in Table 6.2.

For greater clarity, we therefore summarize the overall results in the following tables (Table 6.1 for sales and Table 6.2 for inventory).

	<b>Q1</b>	<b>Q2</b>	<b>Q3</b>	<b>Q4</b>
<b>2021</b>	27%	10%	7%	55%
<b>2022</b>	14%	18%	10%	48%
<b>2023</b>	24%	13%	9%	54%

Figure 6.1: Percentages for *sales forecasting*

	<b>Q1</b>	<b>Q2</b>	<b>Q3</b>	<b>Q4</b>
<b>2021</b>	23%	38%	21%	18%
<b>2022</b>	54%	19%	14%	13%
<b>2023</b>	42%	22%	26%	20%

Figure 6.2: Percentages for *inventory forecasting*

## 6.2 Forecasting for 2024 using the SARIMA Model

To forecast Fiasconaro's sales for 2024, we utilized the **SARIMA model** (Seasonal Autoregressive Integrated Moving Average), which is well-suited for time series data with both seasonal and non-seasonal components. Given the clear seasonal trends in the company's sales data, particularly around key events like Christmas and Easter, SARIMA was the ideal choice for generating accurate forecasts.

### Variable Selection

In order to ensure the forecasts generated by the model are meaningful and actionable, we selected variables encompassing key economic metrics such as **quarterly revenues, operational costs, profit margins, and other significant financial indicators**. These variables were chosen because they have a direct relationship with seasonal

trends and are often influenced by predictable external factors, such as holidays, seasonal changes, and economic cycles.

The selection process was guided by two primary criteria:

1. **Decision-making relevance:** Variables with a direct impact on short- and medium-term business decisions were prioritized.
2. **Seasonal behavior:** The presence of recurring patterns, such as seasonal peaks in revenues or costs linked to specific times of the year, was carefully assessed.

This approach ensured that the forecasts are targeted and can be utilized to optimize resource management and business planning.

## Time Series Analysis

After identifying the relevant variables, a detailed analysis of the time series from the past three years was conducted. This analysis allowed for the observation of temporal trends and the identification of key characteristics such as **long-term trends, seasonality, and residual variability**.

The time series plots revealed a well-defined **annual seasonality**, with peaks and troughs recurring at the same times each year. For instance, revenues were observed to increase during quarters associated with holidays or high commercial activity, while declining during quarters with less activity.

Quantitative tools, such as **time series decomposition** into seasonal, trend, and residual components, were employed to confirm the presence of these recurring patterns. This step was essential to understanding how to appropriately model the data and underscored the need for a model capable of capturing these seasonal and trend dynamics.

## SARIMA Model Construction and Application

Following the preliminary analysis, the SARIMA model was constructed. SARIMA was chosen for its ability to integrate autoregressive (AR), differencing (I), and moving average (MA) components, both at seasonal and non-seasonal levels. Specifically, SARIMA effectively addresses the observed seasonality in the data, which in this case recurs every four quarters ( $m = 4$ ).

The key steps in the model construction were as follows:

1. **Data splitting:** The dataset was divided into a *training set* (2021-2022) and a *test set* (2023) to validate the model's predictive capability.
2. **Parameter identification:** Optimal values for the parameters  $(p, d, q)$  and  $(P, D, Q, m)$  were identified using an iterative process and selection criteria like the *Akaike Information Criterion (AIC)*.
3. **Model training:** The model was trained on historical data, fine-tuning the parameters to minimize forecast error on the test set.

4. **Model validation:** Forecasts were compared to actual data using accuracy metrics such as *Root Mean Square Error (RMSE)* and *Mean Absolute Percentage Error (MAPE)*.

The calibrated model was then applied to forecast the values of 2024. The results demonstrated strong adherence to historical dynamics, confirming the model's ability to capture both seasonal patterns and long-term trends.

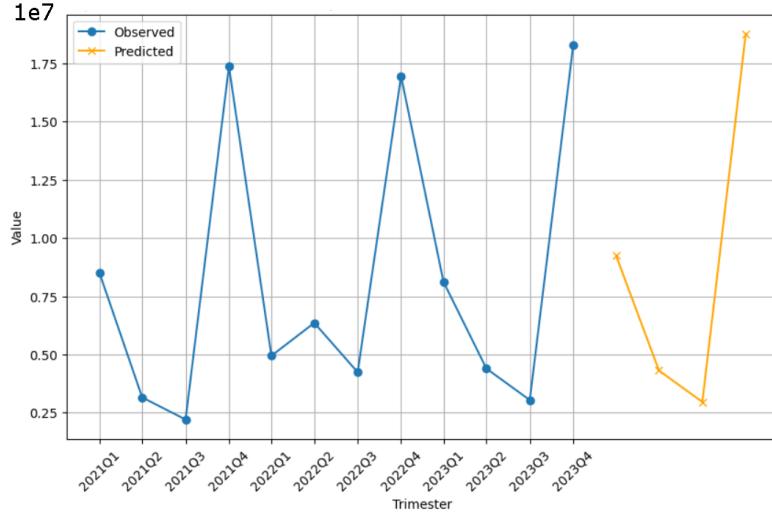


Figure 6.3: Time series and forecasting for: total value of production.

### 6.3 Budget Construction for 2024

Using the SARIMA model, we forecasted the sales for each quarter of 2024. These forecasts formed the foundation for the budgeting process. Below (Table 6.3) are the projected sales figures for each quarter in 2024:

Quarter	Projected Sales (€)
Q1	9,247,193
Q2	4,313,507
Q3	2,963,238
Q4	18,767,688

Table 6.3: Projected sales for 2024.

Thus, the **total projected sales** for 2024 amounted to:

$$\text{Total Sales in € 2024} = 9,247,193 + 4,313,507 + 2,963,238 + 18,767,688 = 35,291,626 \text{ €}$$

To estimate the **total sales in units**, we treated both *colombe* and *panettone* as a single product. Based on the forecasting results, we estimated an average price for this product using the company's actual pricing data. After analyzing the costs of various panettone and colombe products, we set an average price of €33 per unit. This estimate considered the 2023 pricing, where the classic panettone, the most popular option, was priced at €23, while more elaborate creations or those resulting from collaborations were priced between €50 and €60.

Thus, the projected number of units sold in 2024 was calculated as follows:

$$\text{Number of Units sold in 2024} = 35,291,626 \div 33 = 1,069,443 \text{ units}$$

We then calculated the number of units produced for each quarter, as well as the percentage of total sales that each quarter represented. This allowed us to break down the annual projections, facilitating production planning and resource allocation according to seasonal demand patterns. The results are shown in Table 6.4.

	<b>Q1</b>	<b>Q2</b>	<b>Q3</b>	<b>Q4</b>
<b>N of Units</b>	278,054	128,333	96,250	566,806
<b>Percentages</b>	26%	12%	9%	53%

Table 6.4: *Number of Units and Percentages for the forecasted sales.*

Next, we calculated the **costs associated with producing the panettone and colombe**. These costs included raw materials, labor, and other variable expenses, which were multiplied by the number of units produced. We assumed that the cost of producing one panettone was €12. The production cost for each quarter was calculated using the following formula:

$$\text{Production Cost Q} = \text{Number of Units Q} \times €12$$

In addition, **fixed costs** (such as rent, salaries, and marketing expenses) were accounted for. The total fixed costs forecasted for the year amounted to €4,125,624, which we divided equally across all four quarters.

The variable and fixed costs for each quarter are presented in Table 6.5.

	<b>Q1</b>	<b>Q2</b>	<b>Q3</b>	<b>Q4</b>
<b>Variable Costs in €</b>	3,336,648	1,539,996	1,155,000	6,801,672
<b>Fixed Costs in €</b>	1,031,317	1,031,317	1,031,317	1,031,317

Table 6.5: *Variable and Fixed costs forecasted.*

## Budgeted Gross Profit for Each Quarter

With the sales revenue and production costs in hand, we were able to calculate the **gross profit** for each quarter:

$$\text{Gross Profit Q} = \text{Revenue Q} - \text{Production Cost Q} - \text{Fixed Costs Q}$$

The results are shown in Table 6.6.

	<b>Q1</b>	<b>Q2</b>	<b>Q3</b>	<b>Q4</b>	<b>Total</b>
<b>Gross Profit in €</b>	4,879,228	1,742,194	776,921	10,934,699	18,333,042

Table 6.6: *Gross Profit for each quarter.*

# Conclusion

As we wrap up this report, we take a moment to reflect on what has been a challenging but incredibly rewarding journey. Tackling the business challenge of data-driven forecasting and budgeting wasn't simple, but we've enjoyed every step of the process. Learning about Fiasconaro—a company with such a rich history and inspiring values—was a highlight for all of us, and we truly came to admire the work they do.

Throughout this project, we worked hard to ensure every part of the challenge was thoughtfully addressed. We're really proud of what we've accomplished. Starting with an in-depth analysis of Fiasconaro's financial position, we identified key business drivers and KPIs tailored to their needs. From there, we proposed an innovative software solution that brings together real-time forecasting, market insights, and AI-driven tools in a single, intuitive platform. Our goal was to simplify decision-making and improve financial performance, and we believe the concept is perfectly suited to Fiasconaro's ambitions.

In our proof of concept, we showed how this tool could have a real impact on their financial processes by using advanced forecasting models and driver-based budgeting to deliver actionable insights. On top of that, we're especially proud of the mockup we created, which brings the software to life with a clean, visually appealing design that's easy to navigate.

This project has been about much more than just presenting ideas—it's been a chance to work together as a team, share ideas, and solve problems creatively. We had fun, learned a lot, and supported each other throughout. We put a lot of heart into this work, and it's been an experience we'll all remember fondly.

In the end, we hope our report provides Fiasconaro with valuable ideas and tools to tackle future challenges and seize new opportunities. We're confident that our work shows how data-driven solutions can help a company like Fiasconaro achieve even greater success and continue to thrive in the years ahead.

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