Project Report

This capstone project utilized SQL, Power BI, and Python to analyze Mercado Livre's e-commerce dataset and generate valuable business insights. The analysis revealed monthly revenue trends, top-performing product categories, key customer segments, and payment behaviors. Dashboards provided interactive views for stakeholders, while time-series forecasting predicted future order trends. Each phase contributed to building a complete, data-informed picture to support better decision-making in operations, marketing, and sales.

Actionable Recommendations

1. Focus on High-Performing Categories: Invest more in marketing and inventory for top-selling product categories to maximize revenue.

2. Boost Repeat Purchases: Implement loyalty programs or retargeting strategies for customers with high lifetime value and repeat purchase potential.

3. Optimize Payment Options: Promote the most frequently used and high-value payment methods to streamline customer experience.

4. Improve Forecast Planning: Use the forecasted order trends to plan logistics, staffing, and inventory, especially during seasonal peaks.

5. Monitor Underperforming Segments: Identify low-performing regions or categories and investigate reasons to reduce resource wastage.

Actionable Recommendations

1. Prioritize Top-Selling Product Categories- Allocate more marketing budget and inventory to the top-performing categories identified in the revenue analysis to capitalize on demand.

2. Enhance Customer Retention with Loyalty Programs- Target high-value repeat customers using loyalty incentives, cashback offers, or early access to sales, boosting Customer Lifetime Value (CLV).

3. Optimize Payment Experience- Highlight and streamline the most preferred payment methods (e.g., credit cards or boleto bancário) to reduce cart abandonment and friction in the purchase journey.

4. Plan Inventory Based on Seasonal Demand- Use time-series forecasts to stock up ahead of peak seasons and avoid overstocking during low-demand periods, improving inventory turnover.

5. Segment Marketing by Region and Category- Use geolocation and product category data to run targeted ads in high-revenue states or cities, personalizing campaigns for better ROI.

6. Reduce Operational Costs in Low-Margin Areas- Identify underperforming segments (e.g., low revenue per order or high return rates) and review product strategy or reduce allocation in those areas.

7. Improve Product Listings in Popular Categories- Encourage sellers to enhance descriptions, images, and ratings in high-demand categories to improve conversion rates.

8. Monitor Key Metrics Through Live Dashboards- Implement Power BI dashboards for decision-makers to track monthly performance, category trends, and forecast accuracy in real time.

9. Improve Customer Review and Feedback Systems- Use review frequency and sentiment analysis to identify products with consistent complaints or praise and act accordingly.

10. Run A/B Tests on Promotions and Discounts- Test the effectiveness of various promotional strategies on different product types or customer groups using your existing behavioral data.

Successful execution of this project relies on the collaboration of the following key stakeholders:

Key Stakeholders

Names	Internal Stakeholder	External Stakeholder	Priority Stakeholder
Leadership Team	Strategic planning and performance evaluation relied on executive metrics like revenue trends, customer retention, and seller performance.		
External Partners		Logistics providers and payment partners contributed to key metrics like delivery time efficiency and payment method impact.	
End Users			Customer feedback and purchasing behavior directly influenced sentiment analysis, repeat purchase rates, and AOV insights.

Project Resource Allocation

Review & Iteration
20%

Data Cleaning & Preprocessing
20%

Presentation & Documentation
10%

Exploratory Data Analysis (EDA)
15%

Forecasting & Modeling
15%

Dashboard & Reporting
20%

The budget for this capstone project has been strategically distributed to ensure successful execution across all stages — from data cleaning to forecasting and final delivery. Each phase has been given thoughtful weight based on its importance and time/effort investment
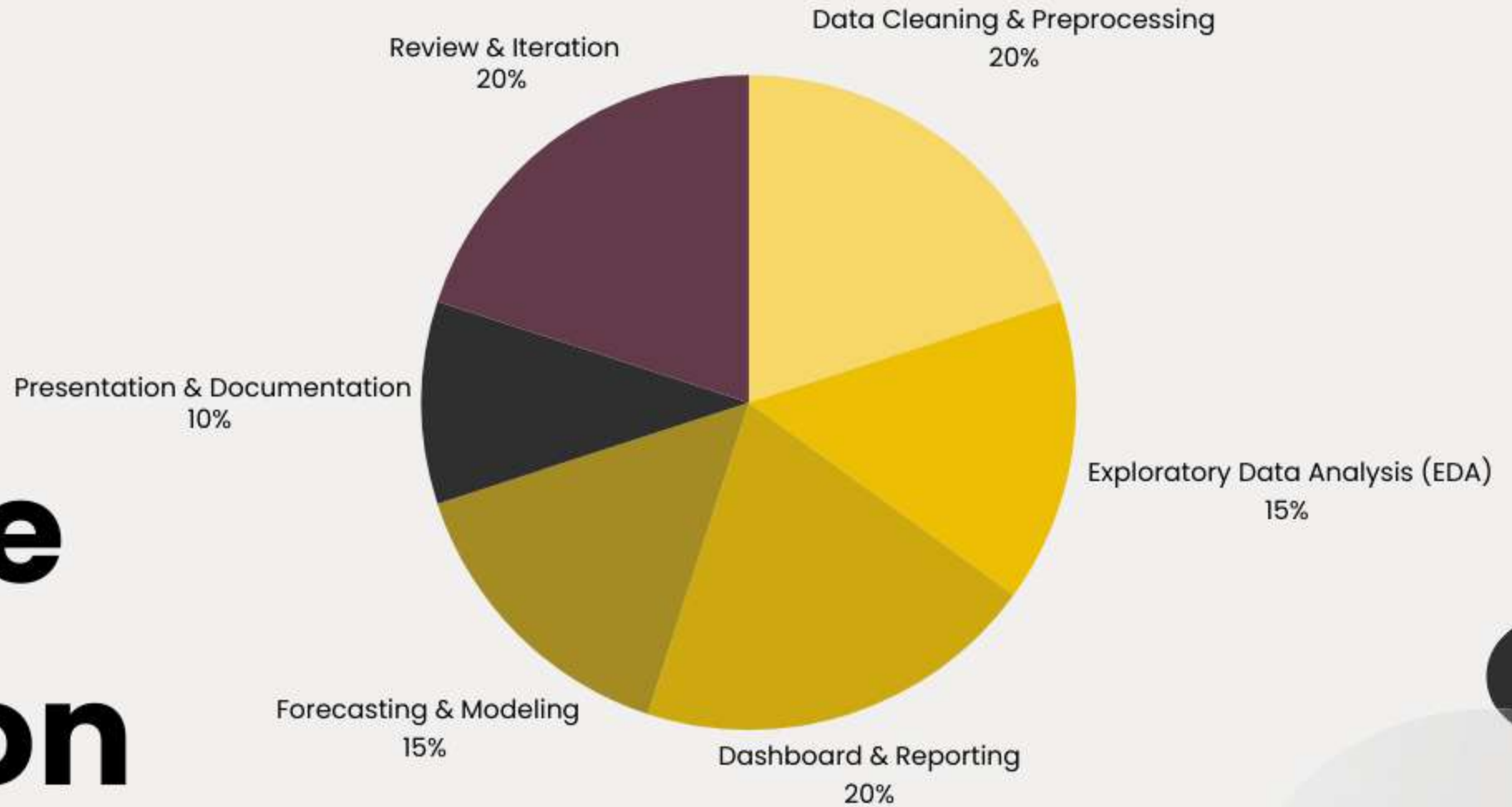
Challenges and Risks

While we are optimistic about the success of the project, there are certain challenges and risks that need to be addressed:

SQL

One of the initial challenges was importing large datasets from MySQL into Python using Jupyter Notebook. While SQL was ideal for storing and querying millions of records efficiently, integrating it with Python for further analysis required establishing proper connections, handling credentials securely, and optimizing queries to avoid timeouts or memory overload. Troubleshooting driver issues and ensuring that the MySQL server was accessible and correctly configured was a time-consuming task that required research and multiple iterations.

EDA

As we moved into time-series analysis, another major challenge was preparing the monthly revenue data correctly. Ensuring that the date column was correctly formatted as a datetime object, setting it as the index, and handling missing months or irregularities were all crucial steps. Errors during this process—such as incorrect index types or mismatches in date formats—caused forecasting functions to fail or produce misleading results, requiring careful debugging and validation at each step.

Python

Finally, during the forecasting phase, we faced the risk of selecting an inappropriate model for the data's nature. Initially, Holt-Winters smoothing produced high error metrics, which raised concerns about seasonality assumptions. Switching to a linear regression approach drastically improved accuracy, but highlighted the importance of model evaluation using MAE and RMSE before making any business decision based on forecast data. Choosing the wrong model could lead to flawed strategic planning, showing how critical data understanding and validation are in real-world forecasting.

Conclusion and Next Steps

Finalize Dashboard Deployment

Complete the design of interactive dashboards in Power BI with functional navigation and filters across all six insight pages.

Begin Testing & Refinement

Gather feedback from mentors, peers, or potential end users to identify improvements in visual clarity, usability, and insight relevance.

Present Insights to Stakeholders

Prepare a concise walkthrough highlighting high-impact KPIs and business takeaways for decision-makers

Monitor & Expand Scope

Explore additional business questions such as customer segmentation (RFM), seasonality forecasting, and cohort analysis to add more depth.

The E-Commerce Capstone Project serves as a robust framework for driving data-informed decisions across customer behavior, seller efficiency, product performance, and operational metrics. Leveraging SQL, Power BI, and Python, this project delivers actionable insights for strategic and operational stakeholders alike. Moving forward, key actions include: