Data Analysis for a Payment Company

1. Data Cleaning and Transformation

My first step was to prepare the data for meaningful analysis. I imported the datasets into Pandas and ensured the data types were correctly cleaned and formatted.

- ● Handling Transactions Data

The transactions dataset contained timestamps, and working with time-based data required precision. I:

- ➔ Converted transaction_date into a datetime format.
- ➔ Extracted date, time, and month from the transaction timestamps.
- ➔ Classified each transaction based on the time of day into five categories: Early Hours, Morning, Afternoon, Evening, and Night. This helped in identifying transaction patterns across different times of the day.
- ➔ Addressed missing values in the failure_reason column by filling NaN values with "NIL" to ensure no gaps in analysis.
- ➔ Dropped the original transaction_date column after extracting necessary details.

- ● Cleaning Merchant Data

The merchants' dataset contained information about vendors accepting payments. I:

- ● Capitalized the merchant_category field to ensure uniformity in categorization.

With data cleaned and structured, I created an SQLite database to quickly store the data for further analysis and ensure efficient querying and retrieval.

2. Data Modeling: Creating a Unified View

To streamline analysis, I adopted the One Big Table (OBT) approach, merging the datasets into a single view. This format allowed for easier querying and faster insights extraction.

Using SQL, I joined:

- ● Transactions with merchants (to get merchant details like name, category, and country).
- ● Transactions with chargebacks (to track refund claims and link them with failure reasons).

- Implemented COALESCE to fill missing failure reasons with chargeback details when available.
- Calculated the days_difference between the transaction date and chargeback date, offering insight into how long it took for the chargeback to be initiated.

With this transformation complete, I stored the new transformed_datasets table in the database.

3. Key Analysis, Insights and Recommendation

With a structured dataset in place, I shifted focus to deriving key business insights. The primary areas of analysis included Revenue, Failure rate and Chargebacks.

Merchant Revenue Trend

Insight:
The top-performing merchants contribute a significant portion of total revenue, with Merchant 33 leading at $33,669.44, followed closely by Merchant 54 ($29,641.44) and Merchant 86 ($29,282.37). This indicates a high concentration of revenue among a few merchants.

Recommendation & Actionable Strategy:

- Incentive-Based Growth Program: Introduce a tiered merchant incentive program where top-performing merchants receive:
  - Lower transaction fees to encourage higher transaction volume.
  - Dedicated account management for improved merchant retention.
  - Co-marketing opportunities to help expand their customer base.
- Support for Mid-Tier Merchants: Provide growth support (e.g., targeted advertising or operational assistance) to merchants in the middle revenue tier to help them scale into top-performing merchants.

Currency Revenue Trend

Insight:
The highest revenue transactions occur in GBP ($443,284.62), NGN ($441,363.27), and USD ($427,867.02), demonstrating dominance in these currencies. EUR ($414,214.53) and KES ($424,604.22) also contribute significantly.

Recommendation & Actionable Strategy:

- Enhance FX Processing: Partner with banks and FX service providers to offer competitive exchange rates, reducing conversion delays and costs.
- Optimize Multi-Currency Payment Processing: Implement smart routing to process payments in the most cost-effective way for high-revenue currencies, ensuring merchants and customers get the best rates.

● Expand GBP & NGN Market Share: Since NGN and GBP dominate revenue, introduce currency-specific promotions to attract new merchants operating in these markets.

Country Revenue Trend

Insight:
The top-performing countries by revenue are Canada ($379,364.45), Germany ($354,607.08), and the UK ($356,530.67). Other high-revenue regions include USA ($358,047.45), Nigeria ($353,593.80), and Kenya ($349,190.21).

Recommendation & Actionable Strategy:

● Country-Specific Growth Initiatives:
    ○ Strengthen partnerships with local payment processors in Canada and Germany to increase adoption rates.
    ○ Expand mobile money penetration in Nigeria and Kenya to optimize transaction flow.
● Localized Marketing & Merchant Acquisition:
    ○ Launch targeted ad campaigns in Canada and the UK, focusing on industries already performing well.
    ○ Offer a fast-track onboarding process for businesses in these high-revenue regions to attract more merchants.

Month Revenue Trend

Insight:
Revenue peaks in June ($322,717.81) and January ($315,549.56), while July records the lowest revenue ($259,591.64).

Recommendation & Actionable Strategy:

● Seasonal Promotions for High-Revenue Months:
    ○ January: Offer discounted transaction fees to retain merchants post-holiday season.
    ○ June: Enhance transaction processing speed and merchant support, as this is a peak transaction period.
● Revenue Boost Strategies for July:
    ○ Introduce cash-back incentives or merchant referral programs in June to counteract the expected dip in July.
    ○ Launch a targeted email marketing campaign in June to drive merchant activity into July.

Merchant Category Revenue Trend

Insight:
Gaming ($443,241.53) and Education ($388,271.20) generate the highest revenue, followed by Finance ($359,127.34) and SaaS ($321,070.72).

Recommendation & Actionable Strategy:

- Industry-Specific Solutions:
    - For Gaming: Implement real-time payout APIs to enable instant withdrawals for users.
    - For Education: Develop a subscription-based payment system tailored to online learning platforms.
- Strategic Marketing:
    - Partner with top gaming and education platforms to integrate Fincra's payment solutions, increasing market penetration.
    - Offer custom pricing models for these industries, encouraging higher transaction volumes.

Payment Method Revenue Trend

Insight:
The most revenue is generated through credit cards ($559,718.11) and mobile money ($544,499.00), followed by bank transfers ($534,543.78) and crypto ($512,572.77).

Recommendation & Actionable Strategy:

- Credit Card Optimization:
    - Strengthen fraud detection systems to prevent chargebacks.
    - Offer 3D Secure authentication to enhance security for high-value transactions.
- Mobile Money Expansion:
    - Improve mobile network partnerships in emerging markets like Kenya and Nigeria to enhance transaction success rates.
    - Offer bulk payment options for merchants in regions where mobile money is dominant.

Day Category Revenue Trend:

Insight:

Early Hours generate the highest revenue ($635,452.00), while Evenings contribute the least ($276,772.08).

Recommendation & Actionable Strategy:

Optimize system uptime and support availability during peak transaction times by enhancing server capacity and ensure 24/7 customer support during peak transaction hours to prevent delays and service disruptions.

Failure Rate Analysis

Insight:
A total of $271,017.18 was lost in failed transactions. Mobile money (150 failures) and bank transfers (142 failures) experience the highest failure rates, while NGN (121) and USD (111) transactions fail most frequently.

Recommendation & Actionable Strategy:

- Improve Payment Processing for Mobile Money & Bank Transfers:
    - Implement auto-retry mechanisms for failed transactions to increase success rates.
    - Work with local telcos to enhance mobile money processing infrastructure.
- Reduce NGN & USD Failures:
    - Ensure stable FX liquidity for NGN and USD transactions to prevent declines due to exchange rate fluctuations.

Chargeback & Fraud Analysis

Insight:
Total chargeback revenue loss amounts to $65,844.71, with the highest chargeback frequency in crypto (35 cases) and credit card (33 cases). The most common failure reasons are fraud (39 cases), duplicate transactions (38), and unauthorized payments (26).

Recommendation & Actionable Strategy:

- Strengthen Fraud Prevention:
    - Deploy AI-based anomaly detection to identify suspicious transactions before they are processed.
    - Require two-factor authentication (2FA) for crypto and high-value credit card transactions.
- Optimize Chargeback Resolution:
    - Develop an automated dispute resolution portal where merchants can address chargebacks quickly.
    - Implement real-time alerts for merchants when a chargeback is initiated, allowing immediate action.

Potential Fraud Detection

Insight:
Duplicate transactions and unauthorized payments account for $46,007.57 in chargebacks, with most occurring within 1 day.

Recommendation & Actionable Strategy:

- Enhance Real-Time Fraud Monitoring:
    - Implement instant transaction monitoring alerts for merchants.
- Prevent Duplicate Transactions:
    - Allow user notifications for duplicate charges, enabling quick cancellation.

Conclusion

With these insights and by implementing these strategies, the payment company can enhance transaction security, optimize payment processing, and support merchant growth, ultimately reducing failed transactions and chargebacks while improving overall revenue performance.