Customer Sign-Up Behaviour & Data Quality Audit – NovaTech Solutions Ltd

Overall Recommendation

NovaTech Solutions Ltd. should refine its sign-up interface, leverage peak social media days, expand regional reach, and strengthen opt-in incentives. In parallel, data entry validation should be improved to ensure long-term data quality.

1. Introduction

This report presents findings from an exploratory data analysis (EDA) and data quality audit of customer sign-up records in the customer_signups.csv dataset. The objective was to uncover behavioural patterns, assess data quality, and generate insights that can guide NovaTech Solutions Ltd. in refining its customer acquisition strategies.

2. Objectives

The analysis was designed to:

- Identify overall trends in customer sign-ups

- Examine variations in sign-ups across regions, age groups, and genders

- Assess the completeness, consistency, and accuracy of the dataset

- Provide actionable business recommendations

3. Type of Analysis Conducted

- Exploratory Data Analysis (EDA): Identified trends and distributions across demographic, temporal, and categorical dimensions

- Data Quality Audit: Checked for missing values, duplicates, inconsistencies, and formatting issues

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4. Tools and Technologies

- Python – data exploration and processing

- Pandas – manipulation and aggregation

- Matplotlib & Seaborn – visualizations

- Jupyter Notebook – analysis environment

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5. Data Cleaning Process

- Duplicates removed: based on customer_id

- Standardization: normalized inconsistent categories (e.g., "basic" vs. "Basic")

- Date formatting: signup_date converted to datetime

- Missing values handled:

    - Empty plan fields labelled "Unknown" (see fig. 1.)
    - Missing marketing opt-in defaulted to "No"

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58]
··  region
    North      52
    South      47
    East       45
    West       35
    Central    29
    Unknown    24
    Name: count, dtype: int64
```

Fig. 1.

```
···   1    2024-02-01
      2    2024-03-01
      3    2024-04-01
      4    2024-05-01
      5    2024-06-01
      Name: signup_date, dtype: datetime64[ns]
      datetime64[ns]
```

Fig. 2.

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6. Business Questions & Answers

Q1: How do customer sign-ups vary across age groups?

- Younger age groups recorded the highest sign-ups, confirming higher adoption among younger demographics.
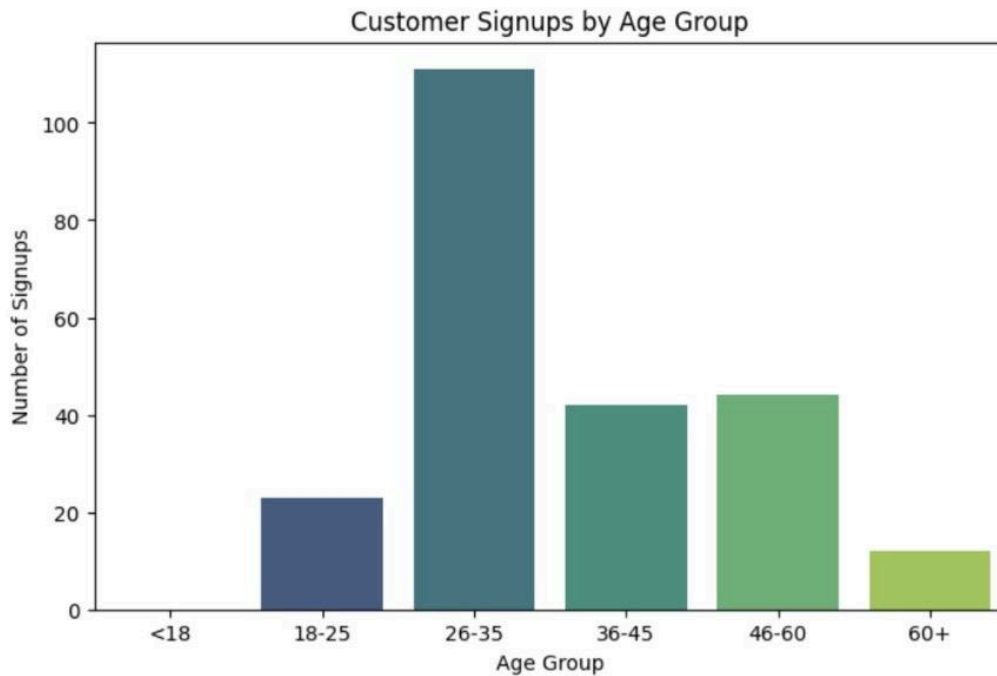
Fig. 3. Customer Signups by Age Group - Barplot

Q2: What are the monthly and weekly signup trends?

- Sign-ups peaked mid-month and were highest on Fridays and weekends, showing clear temporal patterns in customer behaviour.
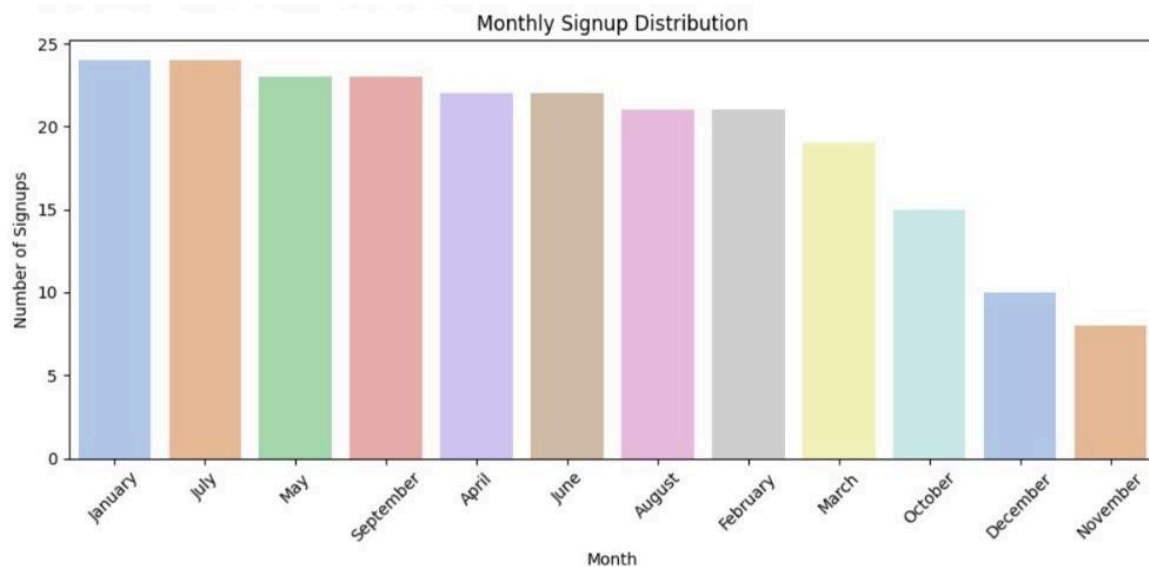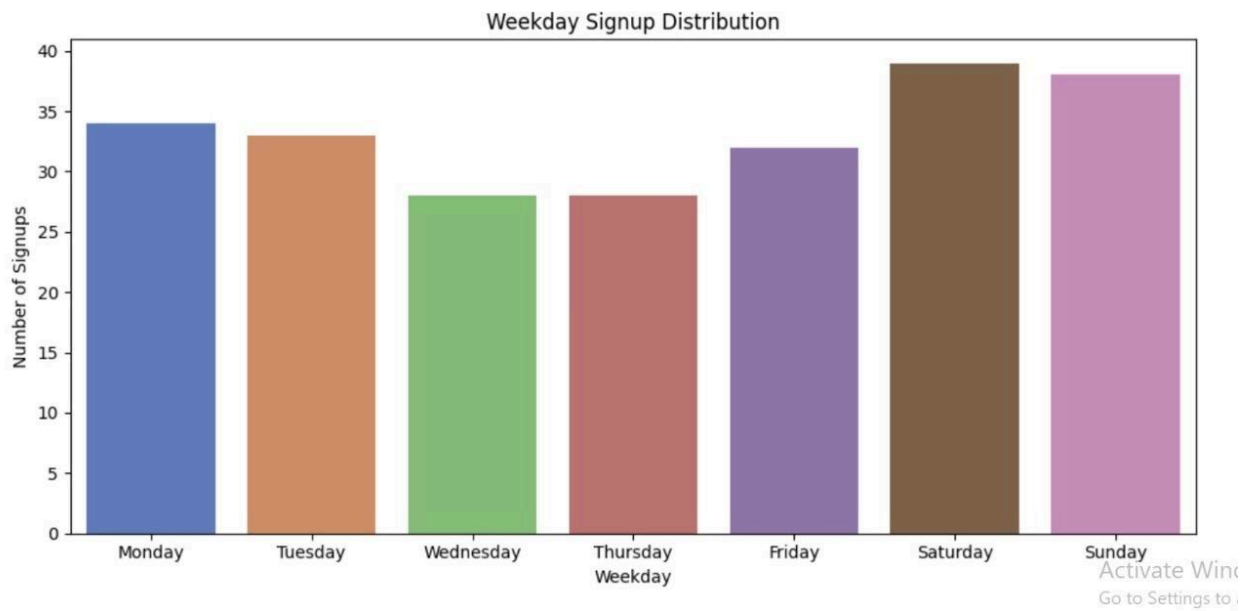
Fig. 4. Monthly Signup Distribution - Barplot

Fig. 5. Weekday Signup Distribution - Barplot

Q3: How does gender distribution vary across age groups?

- Sign-up patterns showed differences between male and female users within age groups, highlighting potential gender-targeting opportunities.
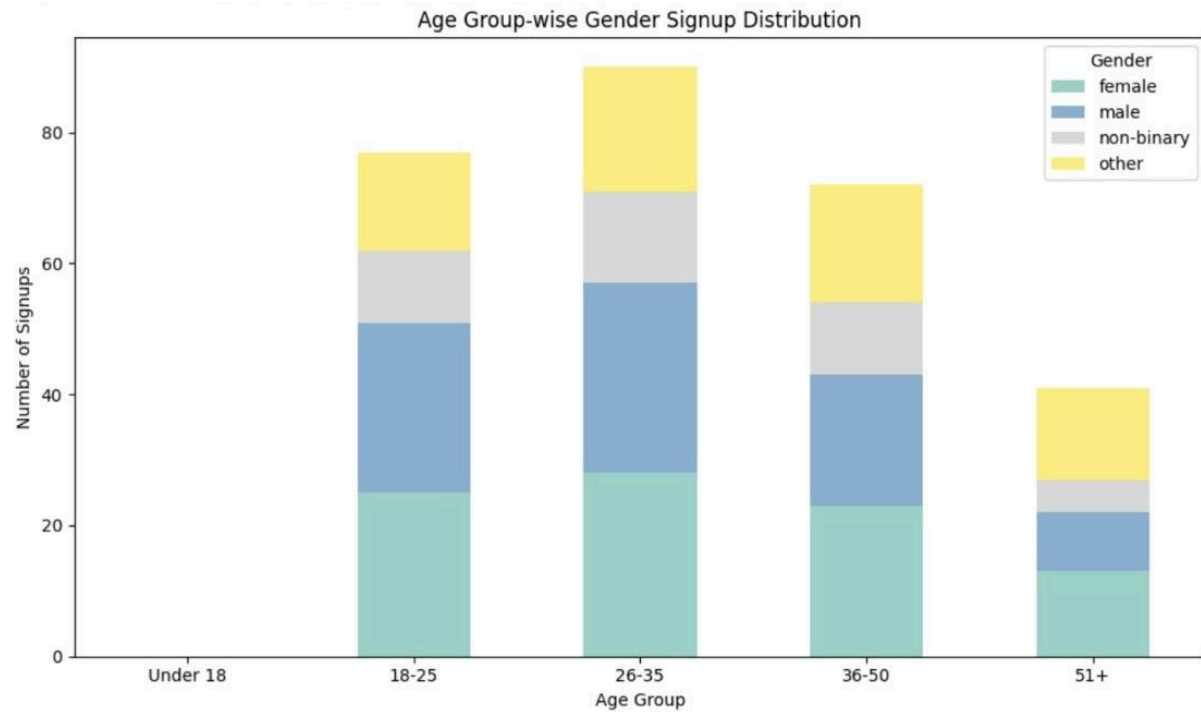
Fig. 6. Age Group-wise Gender Signup Distribution - Stackedbar

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Q4: How does sign-up behaviour differ by region and gender?

- The West and South regions generated the highest sign-ups.

- Gender distribution also varied by region, suggesting cultural or regional influences in adoption.
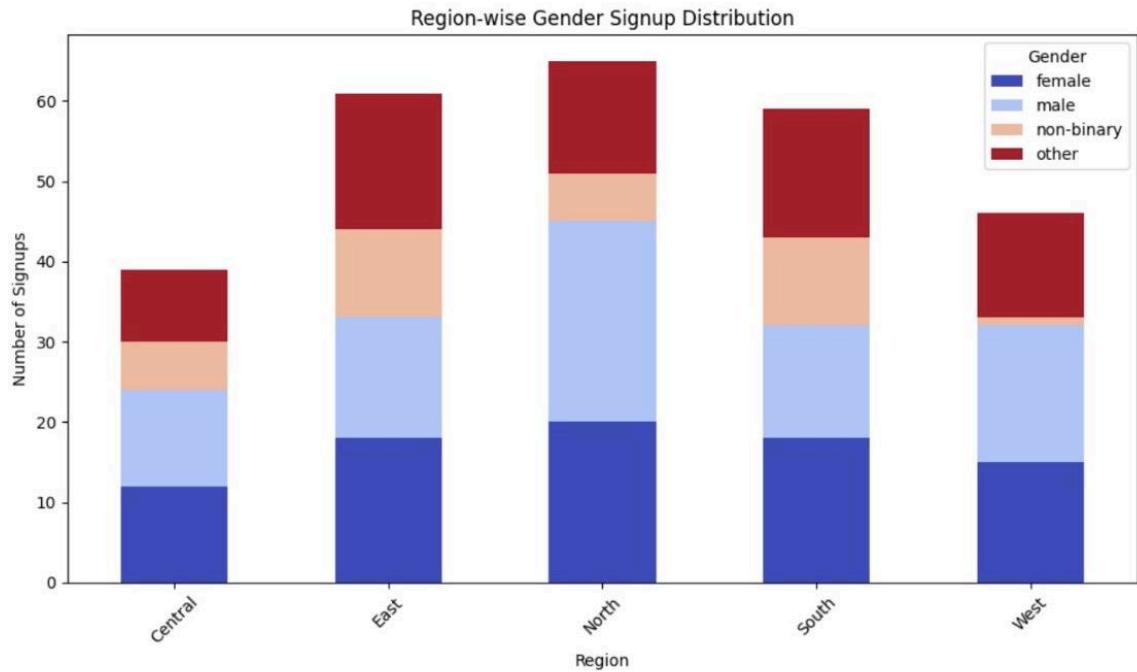
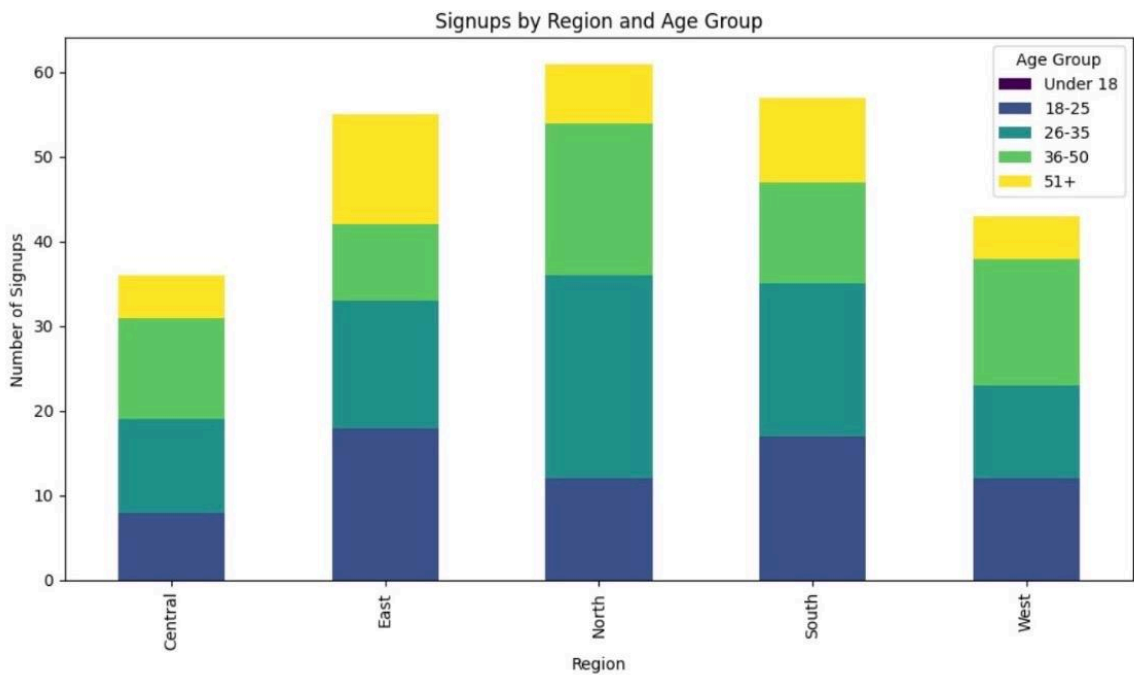*Fig. 7. Region-wise Gender Signup Distribution – Stacked Barplot*

Fig. 8. Signups by Region and Age Group – Stacked Barplot

7. Key Insights

- Younger users drive sign-ups, confirming adoption is strongest among digital-native demographics.

- West & South regions outperform others, while East lags significantly.

- Sign-ups cluster around Fridays and weekends.

- Gender dynamics vary across regions and age groups, hinting at localized engagement behaviours.

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8. Recommendations

1. Target Younger Demographics: Focus campaigns on age groups that show the highest adoption.

2. Leverage Timing: Run marketing pushes mid-month, especially Fridays/weekends.

3. Regional Expansion: Invest in tailored campaigns to boost adoption in the East region.

4. Gender-Aware Marketing: Customize content based on gender-specific engagement patterns in different regions.

5. Strengthen Data Entry Validation: Use dropdown menus and checks to minimize inconsistencies.

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9. Conclusion

The exploratory data analysis and quality audit revealed important demographic, regional, and temporal patterns in sign-up behaviour. By aligning marketing efforts with these insights and improving data quality practices, NovaTech Solutions Ltd. can strengthen its customer acquisition funnel and ensure long-term reliability of its customer database.