EXTRACTING BRAND PERCEPTION DRIVERS USING FACTOR ANALYSIS IN PYTHON FOR A U.S. CONSUMER ELECTRONICS BRAND

1. Background

A national consumer electronics company with a growing U.S. market presence launched a brand perception study across five regions. The survey asked customers to rate their perceptions of the brand across multiple dimensions—design, reliability, innovation, service quality, etc.

The marketing team needed to reduce the dimensionality of the dataset and identify a smaller set of underlying constructs that shaped how consumers perceived the brand. We were hired to apply Exploratory Factor Analysis (EFA) in Python and deliver an interpretable model of brand associations for use in product positioning and ad messaging.

2. Objective

- To apply EFA in Python on brand perception survey data
- To identify the latent factors influencing how customers evaluate the brand
- To interpret item loadings and provide a simplified framework of brand drivers
- To support segmentation and positioning by delivering factor-based customer insights

3. Data Used

Source: Online survey conducted by the client's customer research agency

Dataset Details:

- 2,150 completed responses
- 20 Likert-scale items (1–5) evaluating brand perception
- Categories included:
    - Product design
    - Price-value alignment
    - Customer service experience
    - Brand trust

- Innovation and trendiness
- Sustainability perception
- Community impact

4. Methodology

4.1 Data Preparation

- Confirmed internal consistency (Cronbach's alpha = 0.91)
- Reverse-coded 2 items to maintain scale directionality
- Checked assumptions for factor analysis:
  - **KMO = 0.88**
  - **Bartlett's Test**: $p < 0.001$

4.2 Factor Analysis Execution

- Conducted EFA using factor_analyzer package
- Applied **Varimax rotation** for interpretability
- Number of factors chosen via:
  - Eigenvalues > 1
  - Scree plot inspection
  - Parallel Analysis (via random data simulation)

5. Factor Extraction Results

Factor Label	Description	Example Items Loaded	Items Retained
F1: Product Value	Reliability, pricing fairness, durability	"Is worth what it costs"	5
F2: Emotional Appeal	Trust, brand reputation, lifestyle fit	"Makes me feel confident", "Trustworthy"	4
F3: Innovation	Modernity, feature uniqueness, trendiness	"Stands out as modern", "Offers fresh ideas"	3

F4: Support Service	Responsiveness, issue resolution, staff courtesy	"Easy to get help when needed"	4

- Total Variance Explained: **68.5%**
- All factor loadings > 0.52
- One item dropped for cross-loading

6. Interpretation and Use

- **Product Value** and **Support Service** drove satisfaction among repeat customers
- **Emotional Appeal** was highly correlated with loyalty scores and advocacy
- **Innovation** scored lower in the Gen X cohort than among Gen Z and Millennials

The client's marketing team used these results to refine its messaging:

- Rebranded its helpdesk as "Human-first Support"
- Launched content targeting Gen Z with innovation-focused campaigns
- Repackaged "Product Value" items in pricing promo banners

7. Reporting Output

- **Python Notebook**:
  - EFA pipeline with scree plots, rotated factor matrix, and summary statistics
  - Outputs: Final model object and factor scores for each respondent
- **PDF Report (16 pages)**:
  - Executive summary
  - Factor interpretation tables
  - Scree plot and cumulative variance chart
  - Segment-wise factor score comparison (e.g., by age, region)
- **Excel Sheet**:
  - Final factor score dataset for marketing analysis
  - Heatmap of factor correlation matrix
  - Filters for analyzing perception by demographic segments

8. Business Impact

- **Brand messaging** across social and website channels realigned to 4-factor structure
- **Customer loyalty program** adjusted to focus on high “Product Value” scorers
- Q4 post-campaign survey showed a **14% increase** in “Trust” and “Modern” ratings
- Factor structure now used in **yearly brand tracking** to measure perception shifts over time