Plant Resilience Project: Technical Case Study

Project Available on GitHub
Dashboard Available on Tableau

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Project Overview

This project analyzed plant care requirements, toxicity, and care challenge patterns to help a plant nursey reduce customer dissatisfaction and returns. First-time plant owners often select plants that do not match their home environment and lifestyle, leading to high return rates. By building a data-driven framework, I enabled employees to recommend plants effectively, optimized inventory selection, and created actionable guidance through an interactive Tableau dashboard.

Objective & Key Questions

Primary Objective:
Identify plant characteristics and care challenges that most impact customer success and provide employees with actionable recommendations for matching plants to customers.

Key Questions:
- Which plants are most sensitive to Water, Light, and Routine care?
- What proportion of inventory is toxic to pets and humans?
- How frequently are failures caused by multiple care challenges?
- Which beginner plants are safe for pet-owners?
- How can visualizations support staff in decision-making?

Dataset Description

Source: AI-generated dataset
Project Time Period: January 19, 2026 – January 31, 2026
Size: 49 plants, 24 columns covering care, toxicity, scoring, and identifiers.
Structure: Tabular data with numeric and categorical columns.

High-Level Description:
Each plant is described by core care requirements (water, light, routine) difficulty score, difficulty tier, toxicity status, and plant category. Care challenge indicators were derived to guide staff on which areas to emphasize; these do not predict outcomes.

Limitations:
- Two unknown toxicity labels, treated as toxic for safety.
- No customer behavior data; analysis reflects plant characteristics only.
- Simplification of qualitative care descriptions into numeric scales.

Tools & Technologies
- Excel: Data cleaning, scoring, feature engineering, conditional formatting.
- Tableau Public: Interactive dashboards, calculated fields, visualizations
- AI Support: Dataset generation
- Environment: Excel + Tableau workflow

Data Cleaning & Preparation

Excel Actions & Techniques:
- Standardization: Find & Replace, filtering, sorting, capitalization, concatenation, IF functions.
- Conditional Formatting: Color-coding for Difficulty Score (green → red)

Care Requirement Scoring Logic:
- Converted water, light, and routine into a 1-3 scale (low, medium, high) based on descriptive care notes.
- Same rules applied to all plants ensured comparability.

Feature Engineering & Formulas:
- Difficulty Score: Sum of Water + Light + Routine numeric ranks
- Difficulty Tier: Categorized Difficulty Score into Very Easy → Expert
- Care Challenge Indicator: Identified care dimensions contributing most to challenges; ties classified as Multi-Factor
- Safety Icon/Toxicity Alert: IF statements assigning ⚠️/🌱/ ❓ symbols.
- Master Name Column: Concatenated common name + toxicity icon for dashboard labels.

Tableau Calculated Fields:
- Resilience Score, Main Care Challenge Indicator, % of non-toxic plants
- Enabled dynamic labeling, tooltips

Trade-offs & Decisions:
- Unknown toxicity treated as toxic for safety.
- Simplified qualitative data to numeric ranks for comparability.
- Care Challenge Indicators required validation to resolve score ties.

Exploratory Data Analysis (EDA)

Questions Explored:
- Distribution of difficulty by plant category.
- Toxic vs. non-toxic inventory.
- Single vs. multi-factor care challenge patterns.

Visual Insights:
- <u>Donut Chart:</u> Inventory composition by category.

- <u>Plant Index</u>: Horizontal bar graph showing all data available for all plants, sorted by Difficulty Tier.

- <u>Average Difficulty Chart:</u> Showing relative difficulty of plant categories.

- <u>Toxicity Garden</u>: Shows toxic vs. non-toxic plants by category; tooltips provide species and toxicity details.

- <u>The Plant Heartbreak Map</u>: Creative map showing plant origin, care challenge patterns, and playful notes.

Methodology/Analytical Approach

- ***Normalized Scoring:***
    - Water, Light, Routine converted to 1-3 ordinal scales to allow plant comparison

- ***Why the 1-3 Scoring:***
    - Simplifies descriptive care instructions into numeric values
    - Enables analysis of plant difficulty while remaining understandable for non-technical staff.

- ***Difficulty Score:***
    - Sum of all three care dimension scores.

- ***Care Challenge Indicator Determination:***
    - Primary Care Indicator = care dimension with highest score
    - Ties → Multi-Factor label; validated against descriptive care notes to identify which areas staff should emphasize.
    - Note: Multi-Factor label signals multiple care areas with equal weight, not necessarily higher difficulty.

- ***Tableau Dashboard:***

- Used calculated fields to visualize Inventory Resilience, Non-Toxic Inventory and Main Care Challenge.
- Visualized charts: Avg. Difficulty by category (bar), Plant index (horizontal bar), Toxicity Garden, Heartbreak Map, donut chart.

Assumptions:
- Plant characteristics reflect inherent care needs; customer behavior not included.
- Unknown toxicity treated as toxic

Results & Key Findings

- *Toxicity Barrier*: 31/49 plants are toxic; creates a gap for pet-owning beginners.

- *Multi-Factor Challenges*: 45% of plants fail due to multiple care challenges: Light + Water + Routine most common combination.

- *Routine Contribution in Multi-Factor Plants*: Routine care appears in most instances showing its frequent role as a contributing factor.

- *Beginner Plant Gap*: Very Easy + Easy = 15 plants; many are toxic, limiting safe options.

- *Expert Plant Nuance*: Expert plants include some safe options (5/9 non-toxic).

Visualizations & Outputs

- *Plant Care Index*: Reference for staff on all plants in the inventory. Provides information on toxicity, difficulty, plant care, identifying details

- *Average Difficulty by Category*: Highlights categories to aid inventory and recommendation decisions.

- *Donut Inventory Composition*: Quick overview of category distribution.

- *Toxicity Garden*: Visual identification of toxic vs. non-toxic plants; tooltips provide species-specific info.

- *The Plant Heartbreak Map*: World map showing plant origin, care challenges, and Breakup Notes; provides insights creatively.

Business Interpretation

- Multi-factor patterns indicate staff guidance is critical.
- Beginner customers face higher risk; sourcing non-toxic, low-light plants is necessary to fill inventory gaps.

- Predictable care challenge patterns allow proactive interventions; labelling, care cards, and decision tree guidance.

Challenges & Trade-offs

- Synthetic plant rows may introduce slight bias.
- Simplification of qualitative care data required judgement.
- Care Challenge Indicator required validation logic for ties.
- Balancing creativity (Breakup notes) with dashboard clarity.

Limitations

- No customer behavior data; actual plant success may vary.
- Unknown toxicity treated as toxic; may slightly overstate risk.
- Snapshot analysis; future inventory changes may alter insights.
- Difficulty scores reflect plant characteristics, not customer actions.
- Multi-Factor care challenge label highlights tied care dimensions; some low-difficulty plants are included, indicating multiple areas scores equally, not necessarily high risk.

Next Steps & Improvements

- Collect customer care data to refine failure predictions.
- Expand dataset with additional non-toxic, beginner-friendly plants.
- Explore predictive modeling for failure probability.
- Enhance dashboard interactivity for staff training and decision support.

Conclusion

This project demonstrates data cleaning, feature engineering, scoring, validation, and visualization skills, delivering actionable insights to reduce customer returns and improve employee guidance. It shows ability to convert messy qualitative plant data into structured, decision-useful outputs while maintaining creativity and usability for staff.