Complexity Analysis of Factors and Equipment

Special thanks to our Sponsors: Eric Zagorski, Charles Griffiths, Susan Behroozi, & Patricia Buchanan

OVERVIEW

Problem: Baristas can feel overwhelmed due to complex beverage recipes or equipment.

Goal: Provide Starbucks with a methodology to factor complexity into R&D decisions.

Outputs

- **Complexity Score:** % chance a beverage will be ranked more complex than another
- **Ranking of equipment complexity**

Financial Impact	Yearly Magnitude*
R&D Costs	$30M
Turnover Costs	$120M

$4,000,000/yr* Potentially Saved

*Due to the proprietary nature of Starbucks' financials, the true values have been multiplied by a scalar between 0 to 1

Current State

- Barista pain points
- Unknown Complexity Indicators
- Overwhelming training period

Future State

- Unburdened baristas
- Quantified Complexity Indicators
- Streamlined training period

Survey Analysis A

Goal: Identify and rank factors in Starbucks beverage recipes based on their difficulty in use

Method: Survey baristas to attain a ranked list of 20 beverages, then analyze different factors to observe their impact on rankings

DATA COLLECTION

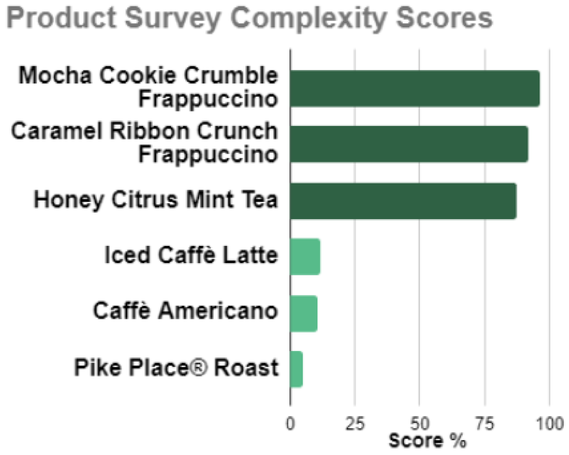
Survey

Factor Compilation

DATA ANALYSIS

ANOVA

Pairwise Factor Analysis



Variance Analysis B

Goal: Explore the relationship between production time variance and drink complexity

Assumption: Larger variance means higher chance of complexity in the process

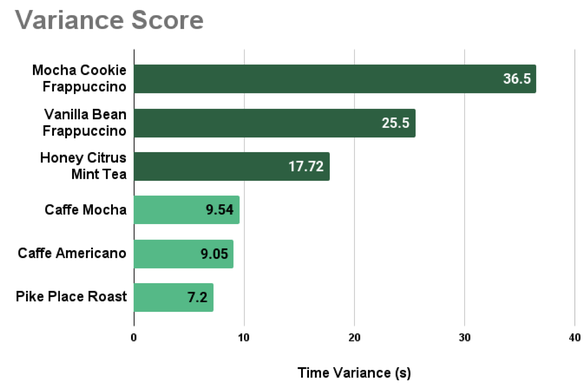
DATA COLLECTION

TAMS Database

DATA ANALYSIS

Data Cleaning

Pivot Table & Chart



Learnability Analysis C

Goal: Ranking Starbucks equipment based on their difficulty to learn

DATA COLLECTION

TAMS Database

Tryer Center Testing

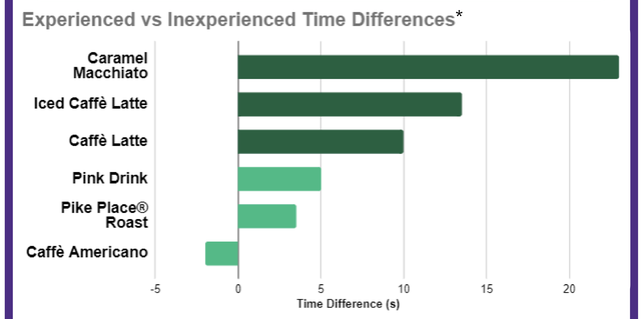
DATA ANALYSIS

Inexperienced Barista Cycle Time Testing

TAMS Database Comparisons

Equipment List Creation

ANOVA With Equipment Factors



*Frappuccinos & teas were unable to be tested due to equipment constraints

Analysis

Complexity Ranking Predictors

Factor	Kendall Coef.
Step Count	0.66
Variance	0.69
Learnability*	0.35

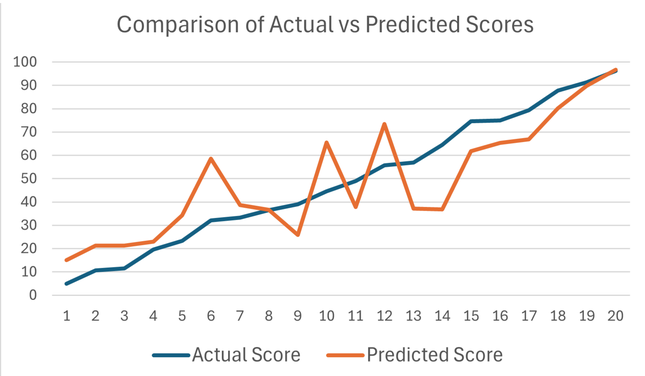
*The Learnability route was constrained by the equipment available for testing, resulting in fewer data points. Further analysis required

Complexity Score = $\beta_0 + \beta_1(SC) + \beta_2(VAR)$

β_0 , β_1 , β_2 = Coefficient Scalars
SC = Step Count
VAR = Variance

Equipment Complexity Rankings

Our routes produced consistent significant factors of complexity in terms of equipment



Complex	Simple
1- Frappuccino Blender	1- Mastrena 2 Shots
2- Shaker	2- Clover Vertica
3- Syrup Pump	3- Caramel Drizzle

Recommendations

1- Expanding Data Collection:
Larger study sizes allow for more accurate analysis methods. Regularly updated data increases relevance

2- Continuous Tracking System:
Implementing real-time tracking of drink preparation times

3- Versatile Framework:
Our methodologies are applicable to various tasks beyond beverage production, such as food and preparation processes