Capstone Project Summary

BUSINESS SIMULATION GAME

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1 – PROJECT INTRODUCTION

The objective of the project is to build a Business Simulation Game for the benefit of Spiiid Ltd, to be applied mostly to Management Team seminars. Whilst many similar products and services have been developed, they are structured in a very generic way with simple interactions. The ambition of this project is to be as close to reality as possible, in one particular sector, Food & Beverage, one specific channel, the retail trade (the dominant channel in food), with real data used to construct the models behind the simulation results. The market selected as background to the game is the French bottled water market.

2 - STARTING POINT

The project is trying to mirror the major dynamics in place. Key transaction points are as follows:



Boxes in green will be directly addressed by the model, partially or fully. The simulation of household shopping patterns has been postponed to further developments of the project at Spiiid Ltd.

3 - APPLIED LEARNINGS FROM THE MSBA AT CEU

Core knowledge involved has been in coding (Python) and data analysis (mainly regression, linear, quadratic or more complex interactions).

4 - DATA ENGINEERING

The game engine is python. All data is in csv format, easy to process and to store. Players inputs come from pre-formatted spreadsheet templates, a business standard that most companies still use today. The platform can be GitHub or Google Drive, or any other platform of the client's choice with controlled access to data. Data used is real data but dating back, mostly from 2009 to 2012.

5 - DATA ANALYSIS

This is the heart of the project. Key findings are:

- Modelling of the market with a temperature-based model built from 7 years of monthly volume data.
 Using train set and 12-month test set to generate a 95% accuracy (at 95% confidence interval), with very strong results in predicting summer season peaks.
- Measuring the relation between gross advertising expenditure and unaided brand awareness:
 - Solely based on investments, with fading impact of past investments as well as gain in unaided awareness by million of euro of gross expenditure.
 - Based on actualized cumulated investments previous year actual data: root means squared error (RMSE) of 3, applied on brands ranging from 2% to 77% unaided awareness.
 - Mirroring industry knowledge of an S curve with a polynomial illustrating fundamental dynamics.



- Measuring the relation between Unaided Awareness and Top-of-Mind awareness (the first brand in mind when interrogated): very strong accuracy with polynomial.



- Measuring the relation between Unaided Awareness + Top of Mind on Brand Penetration: correlation over 98% with RMSE at 1.4. Penetration is highly correlated with market share.



 Measuring promotional efficiency: this category is extremely sensitive to promotions with over 20% of the volume sold on promotion, raising to 35% for Mineral Water. Here the variances are much higher.
 Focusing on some categorical variables and larger sellers gave a good model but still with strong variations (RMSE of 2 on uplifts ranging from 2 to 20.



The retailer data set was built from internet search to professional publications. Focus has been on the top 7 retailers, accounting for 75% of the retail trade with over 5000 stores (hypermarkets and supermarkets). Promotional patterns (frequency, number of flyers, length,...) was compiled from professional data and past personal experience.

Inputs from players can apply to 4 different companies and a set of 10 brands. Results are a function of business plans and retailer's decisions, with limited control from the players. Applying randomization of the standard errors at every steps guarantees unpredictable results and much learning from both the leverages and the uncertainties.

6 - CONCLUSIONS

The different models delivered very strong results in their ability to map critical elements of consumer demand and shopper behavior. To be tested in real life by professional managers.

Further developments will be done to integrate more of the shopper patterns with a full dataset of 29 million households from INSEE.