

POI European Promotion Optimization Summit

Collaborate Globally and Execute Locally



Big Data
Pricing TPO
Retail Execution
Mobility TPM

The role of machine learning to significantly improve forecast accuracy

Carst Vaartjes, Chief Product Strategy, visualfabriq

Today's Goals

- To share best practices on achieving the best possible estimations for demand and financial forecasts in promotional planning.
- Address key questions such as:
 - What are they key elements that enable accurate estimation?
 - How can machine learning help you to improve this?
 - How can you overcome organizational resistance against machine based predictions

Agenda

- Introduction
- Machine Learning
- Current State of Forecast Accuracy
- How to Improve it
- Results & Key Enablers
- Questions

Welcome to the World of visualfabriq

An Agile SaaS Solution Company Delivering An All-in-one Solution for Revenue Management

Purpose

Let's Unleash Your Excellence

Bringing Back Craftmanship in the hand of the people

How

Unlocking internal and external data sources via visualfabriq unique data platform

What

All-in-one Solution for Revenue Management

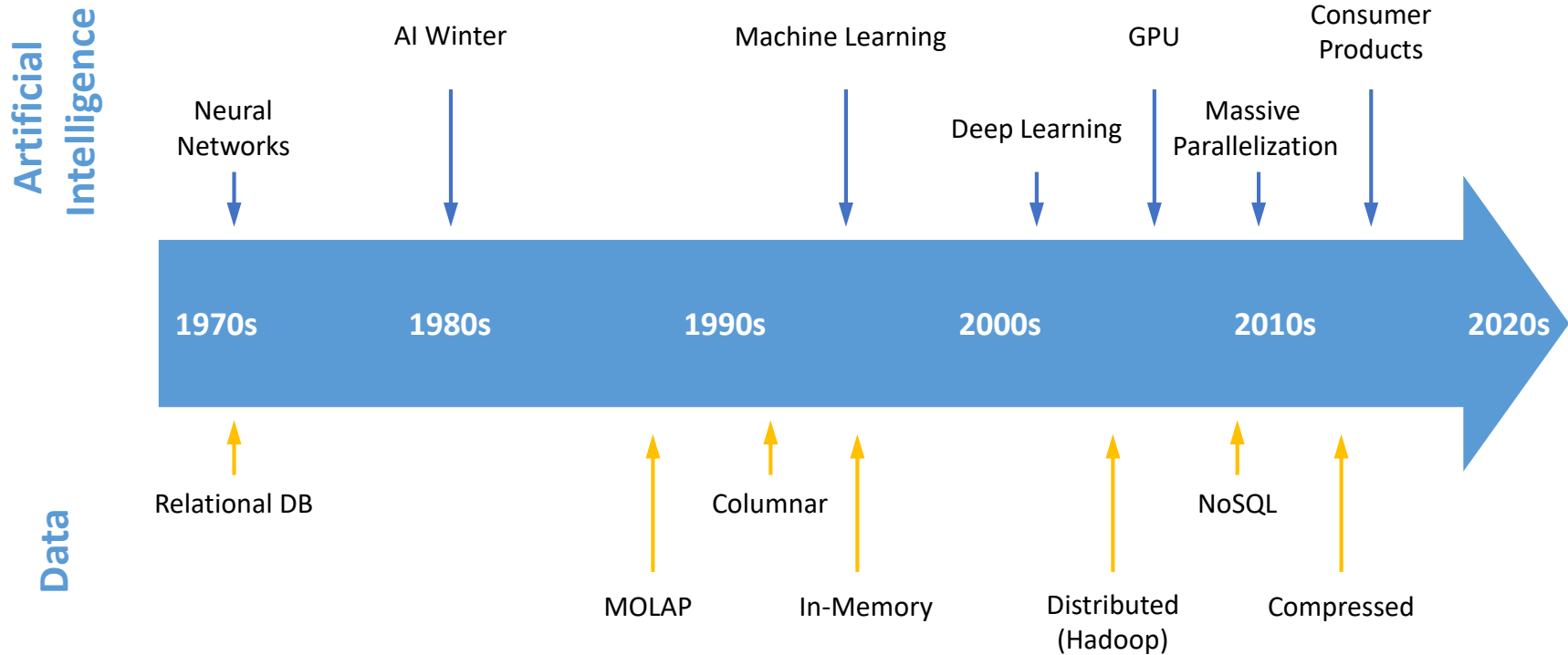
Founded by Carst Vaartjes and Jaco Brussé



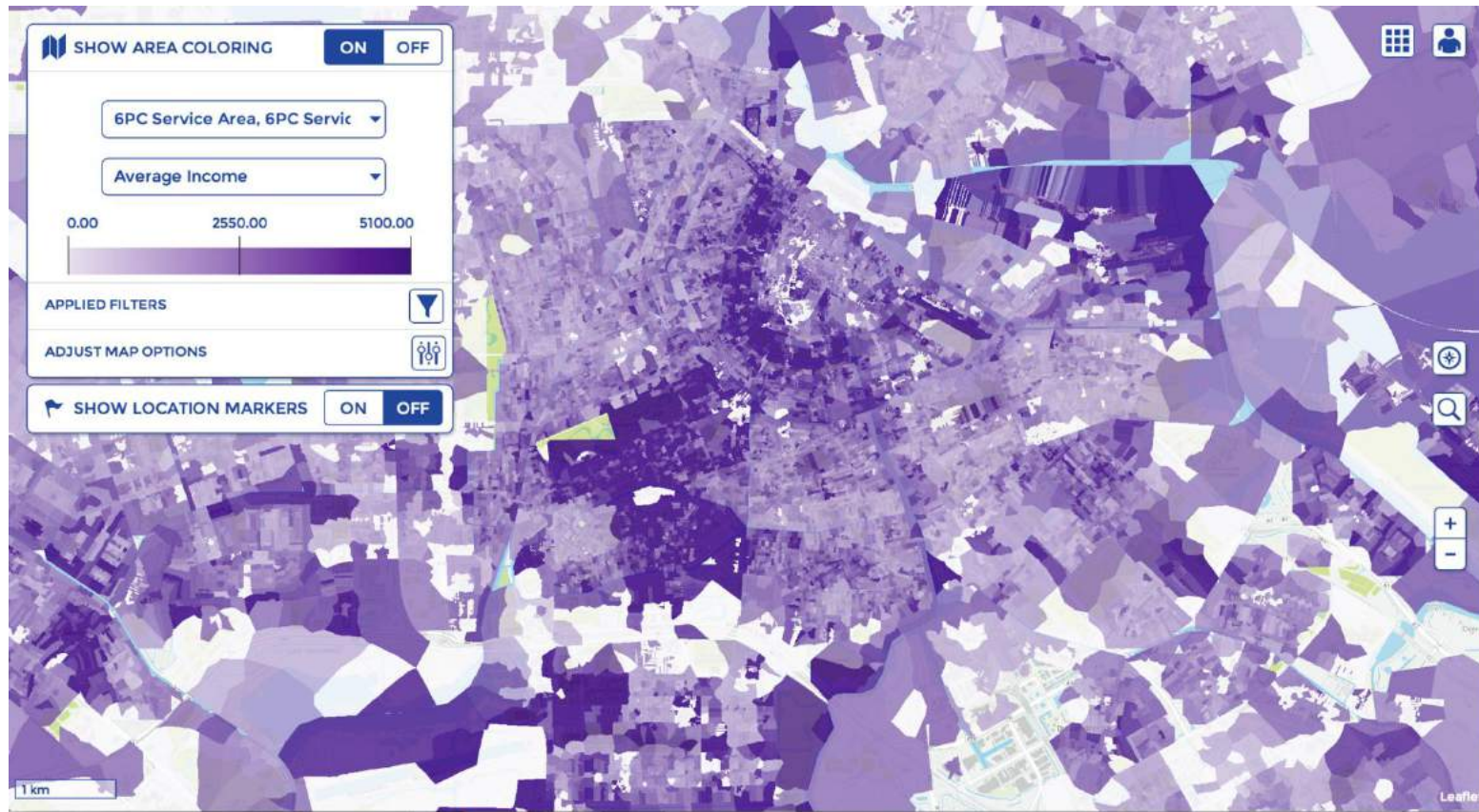

There are millions in potential supply chain savings

- Promotional Pressure is increasing in markets, leading to more costs and bigger uncertainty
- Promotions are the largest disrupting factor in CPG demand
- Uncertainty leads to either out-of-stocks or larger safety stocks
- Reducing this uncertainty can deliver millions in savings in the supply chain

AI and (Big) Data are developing at high speed



There is data about everyone



Retailers are embracing AI for supply chain and consumer insights



Automatic for the people

How Germany's Otto uses artificial intelligence

The firm is using an algorithm designed for the CERN laboratory



TECH | 2/16/2012 @ 11:02AM | 1,485,366 views

How Target Figured Out A Teen Girl Was Pregnant Before Her Father Did

253 comments, 145 called-out [+ Comment now](#)

Every time you go shopping, you share intimate details about your consumption patterns with retailers. And many of those retailers are studying those details to figure out what you like, what you need, and which coupons are most likely to make you happy. Target, for example, has figured out how to data-mine its way into your womb, to figure out whether you have a baby on the way long before you need to start buying diapers.

Charles Duhigg outlines in the *New York Times* how Target tries to hook parents-to-be at that crucial moment before they turn into rampant — and loyal — buyers of all things pastel, plastic, and miniature. He talked to Target statistician Andrew Pole — before Target freaked out and cut off all communications — about the clues to a customer's impending bundle of joy. Target assigns every customer a Guest ID number, tied to their credit card, name, or email address that becomes a



Target has got you in its aim

And manufacturers are also picking it up

Factory & Demand-Side Analytics and Optimization



Throughput, Expense, Fulfillment Capability

Design & Decision Support for reliable capacity to meet demand and ID cost/quality opportunities



Inventory, WIP

Optimized material & labor at each process – throughput & timing as function of variation and interdependencies



Value Chain

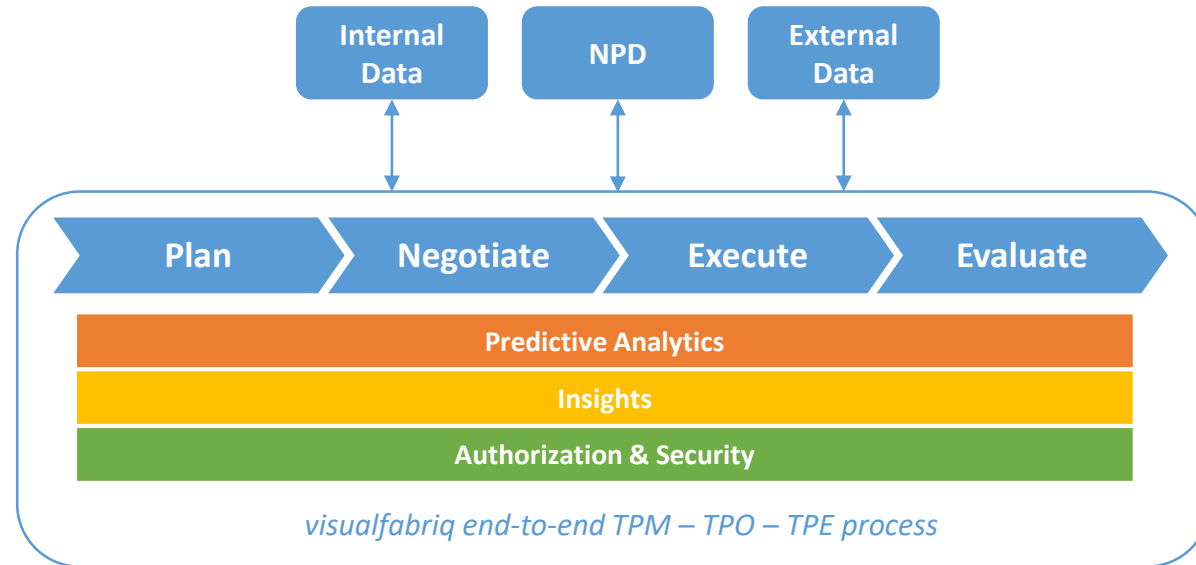
Determine make/buy, plant locations, late point customization, inventory/delivery to fulfill demand and lower cost



Operations Optimization: Engineering & Finance

24

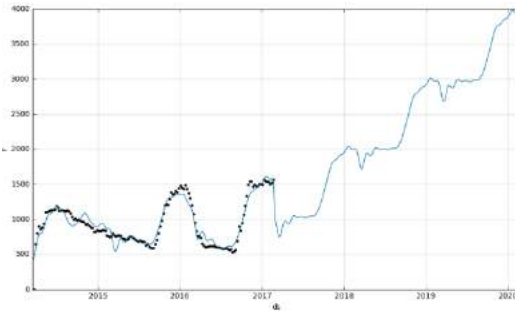
Visualfabriq embeds AI in every step of the TPM process



Different AI for different situations

AI

Baselines



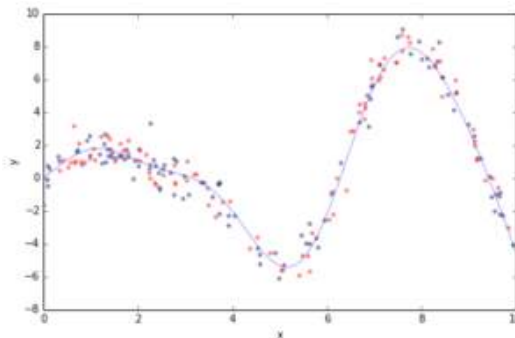
Methods

Bayesian forecasting with Fourier seasonality decomposition

Advantages

Accelerating and improve business-led demand forecasting down to promotional plan accounts

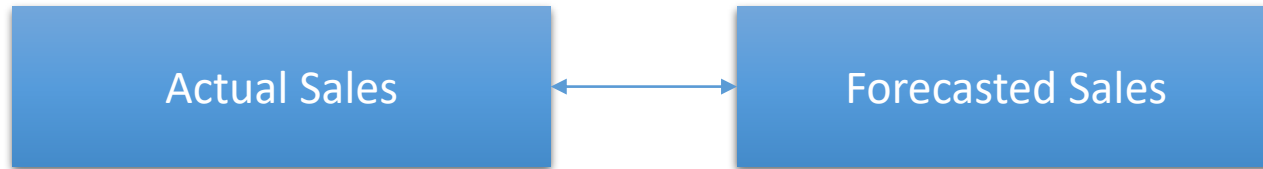
Promotion Lift



Random Forest regression & Gradient Boosters

Handle promotion's high dimensionality with robust, quick-to-execute predictive models

What is Forecast Accuracy?



Supply Chain View:

Country

Month or Week

Product

Promotion View:

Account

Week

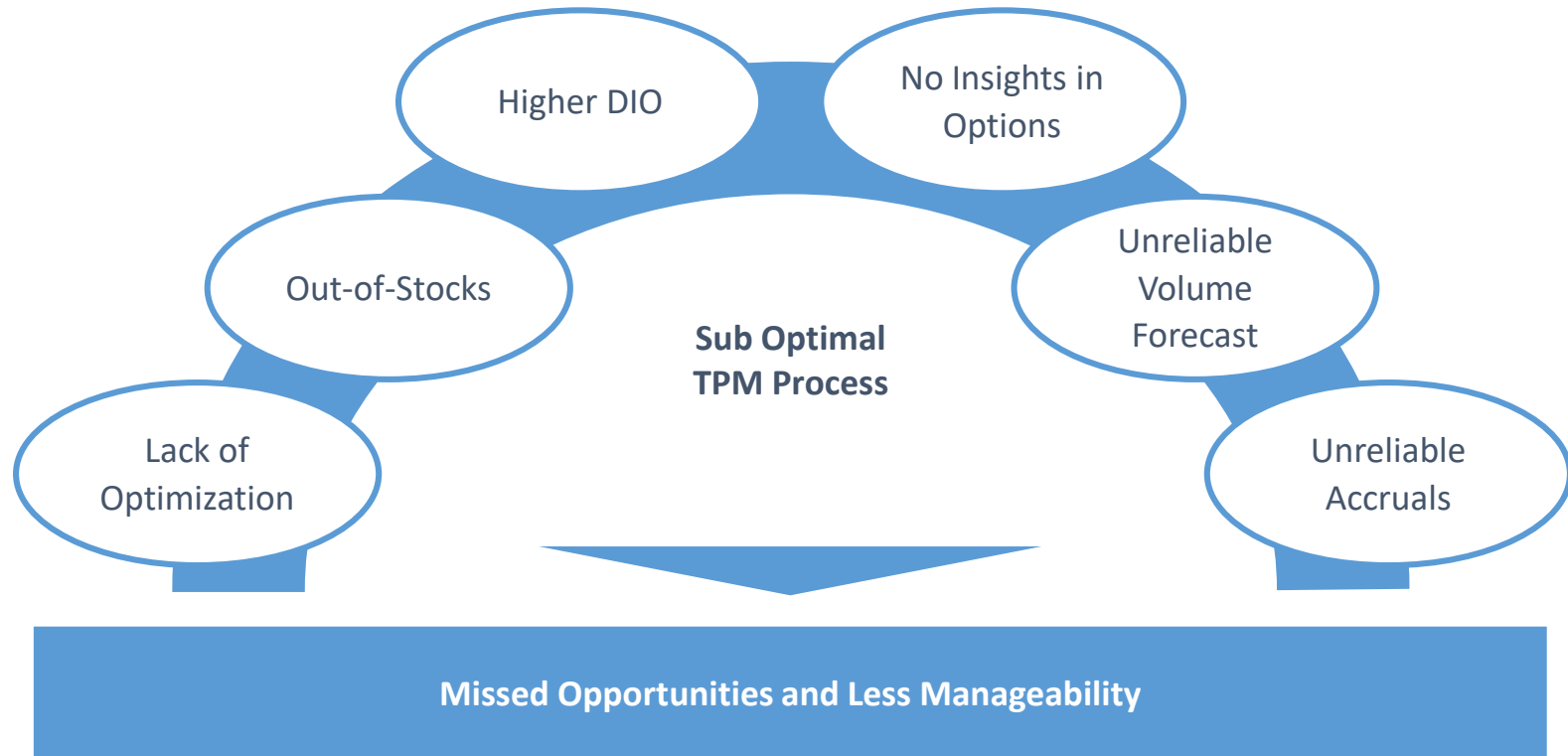
Product

The Current State of Accuracy in the CPG industry

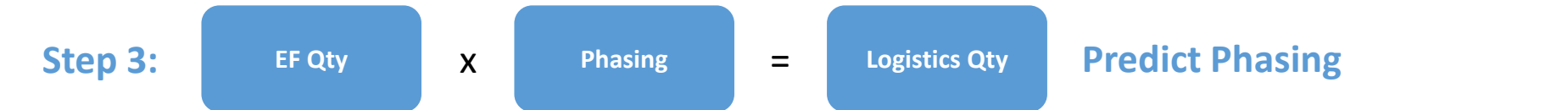
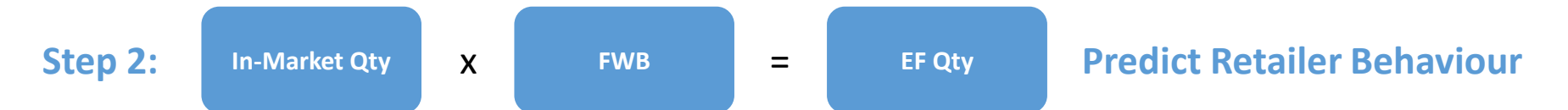
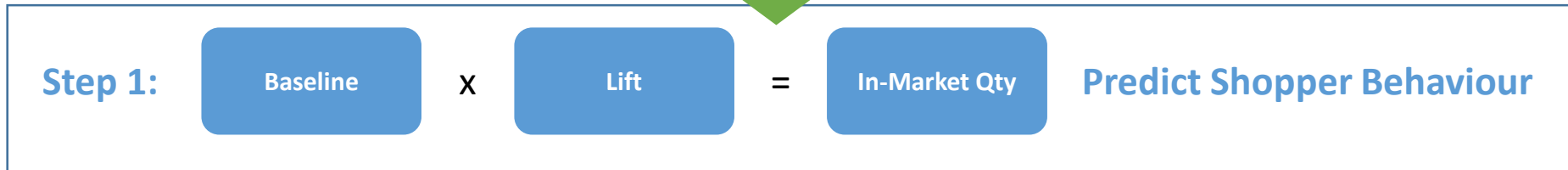


*Figures are based on personal experience over a wide range of CPG organizations
Actuals depend on promotional pressure, categories and markets*

Leading to suboptimal results



The Visualfabriq 3 Step Model

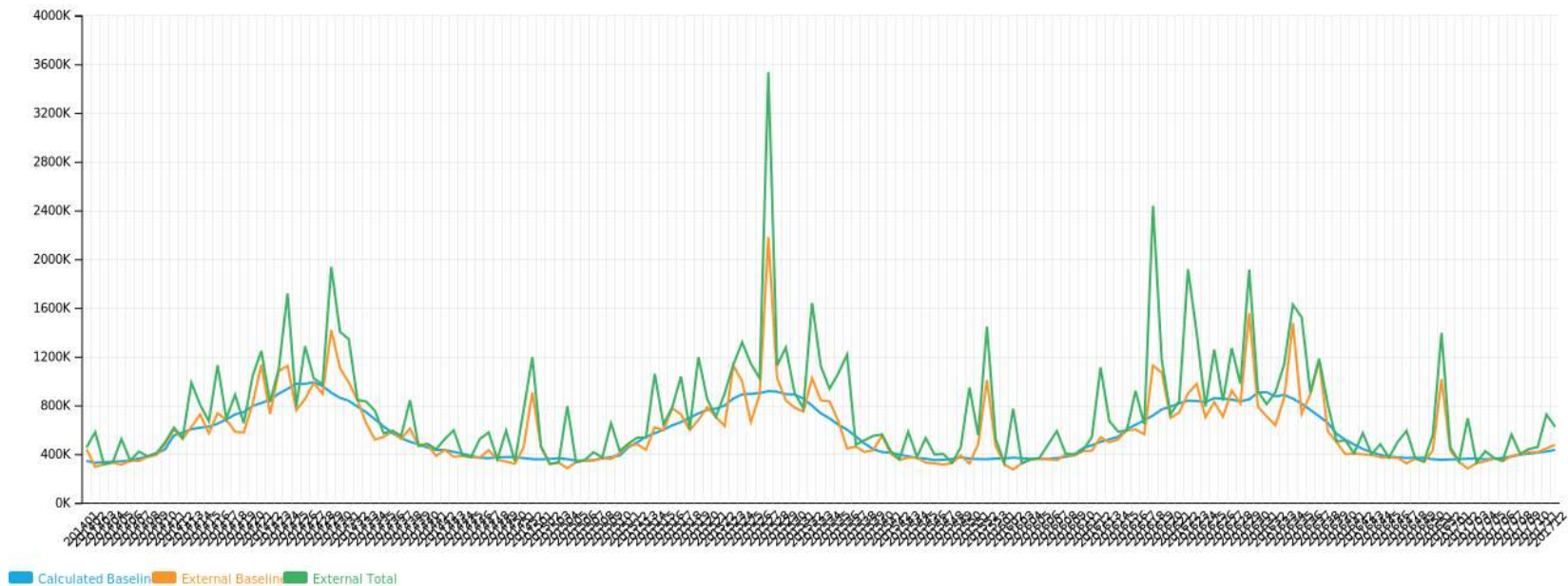


We will focus on Step 1 in this presentation

It all starts with data

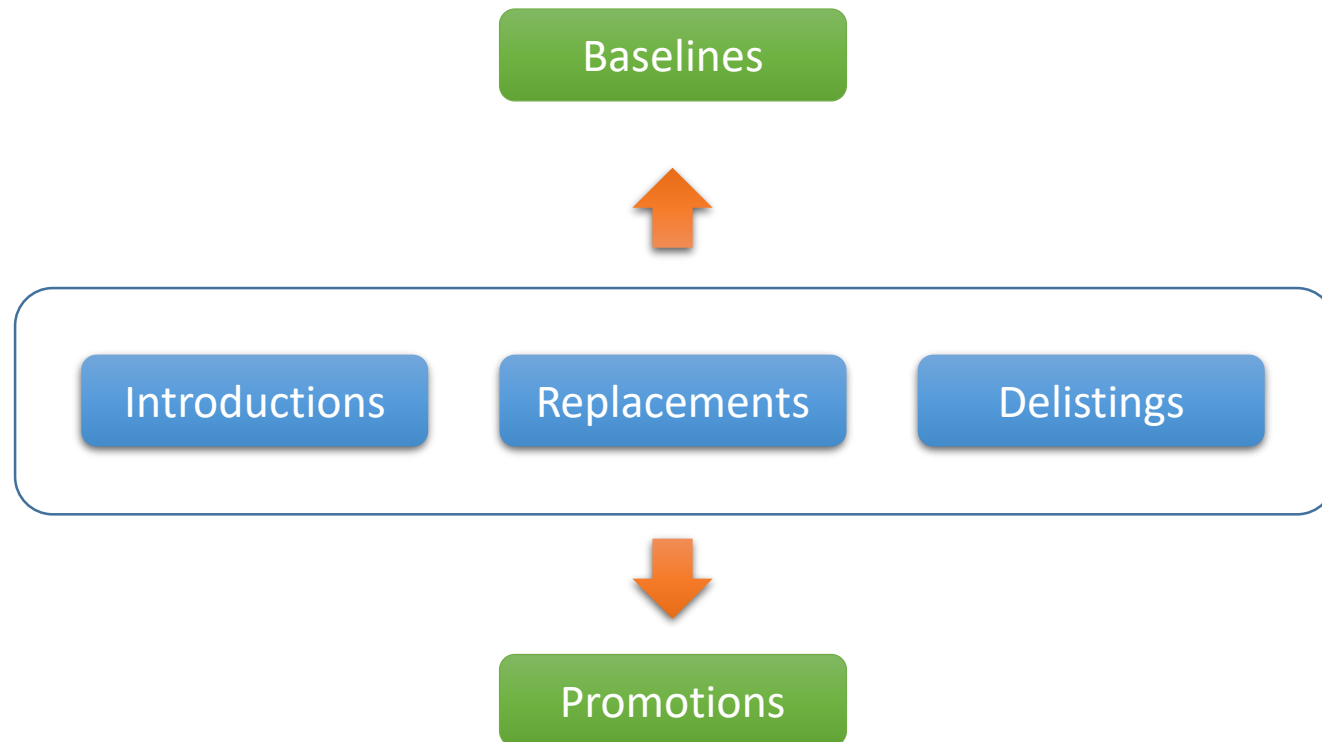


An example of external data issues in a very seasonal market



The corrected baseline is based on a smoothing algorithm

NPD can greatly impact accuracy



And do not forget about displays...

Baselines underlie every prediction

Internal data sources have issues

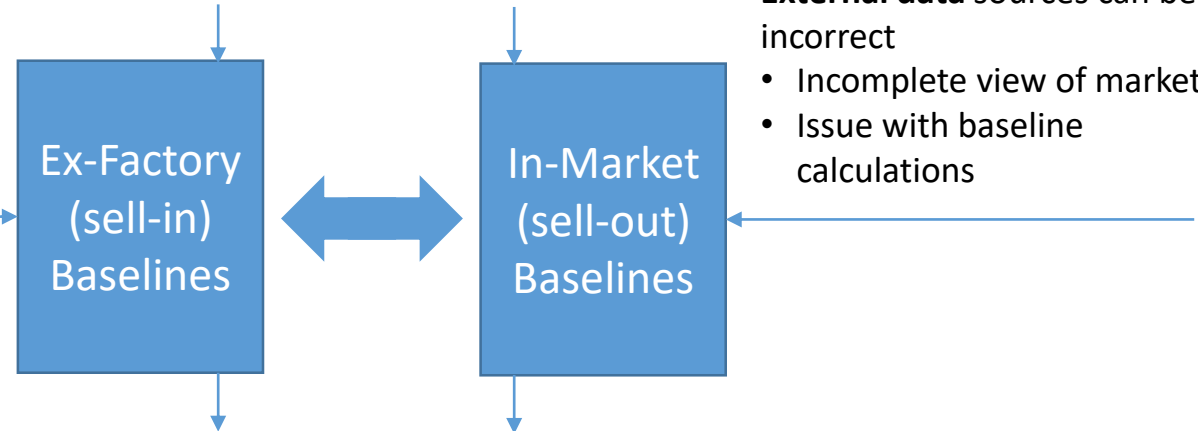
- Promotion flags for on invoice and/or scan (off invoice/rebate) discount
- Non-promoted sales in high promotion pressure markets

Corrections of

- Promotional peaks
- Out of stocks
- Weather effects

External data sources can be incorrect

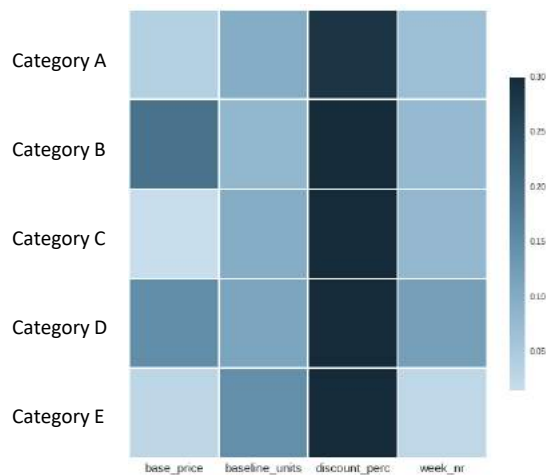
- Incomplete view of market
- Issue with baseline calculations



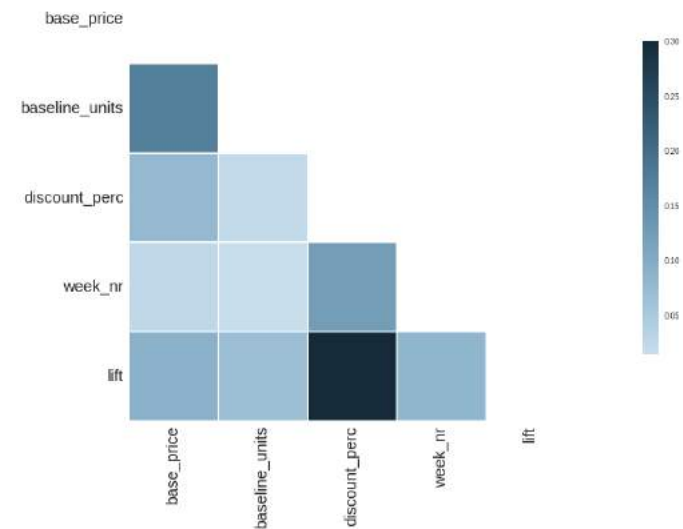
The **resulting baselines** are crucial for understanding promotional effects

- In-Market baselines are best for shopper behavior predictions
- This goes for planning, evaluation and model training
- But often it is not available: you need to seamlessly fall back to internal data where needed

A smartly tuned prediction model

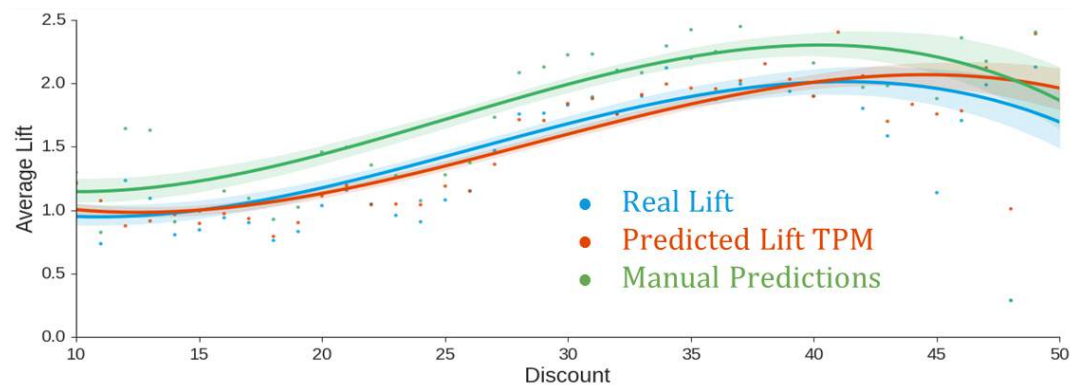
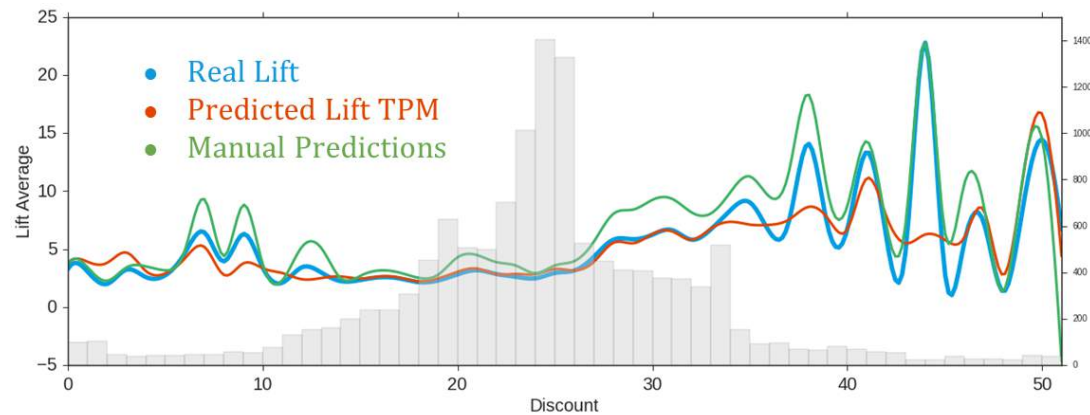


Different Categories can have different statistical drivers



And many variables can potentially be correlated

Can deliver significantly improved accuracy



Start Trusting the Machine

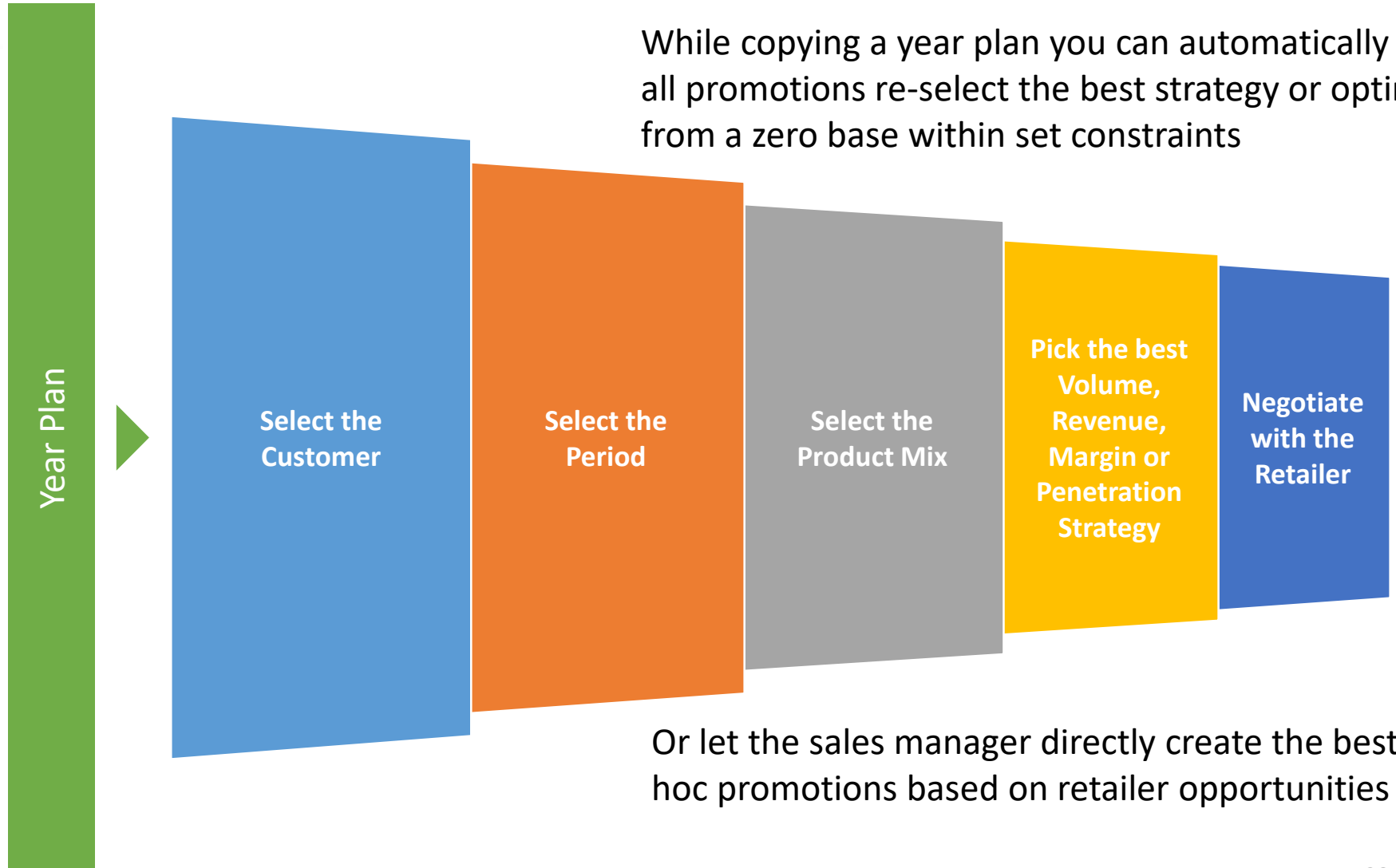
- Machine Learning is radically different from traditional methods such as classical logistical regressions
- Machine learning is significantly more reliable and accurate, but hard to understand the internals
- For users this can lead to black box issues:
 - No simplified, easy-to-understand view on the world
 - No simple optimums (if A always do B)
- Help users to understand:
 - The potential mechanism options and expected outcomes
 - The reliability for a specific promotion by showing the outcome for historical promotions

It's much less scary than a self-driving car



AI enables Zero Touch Planning

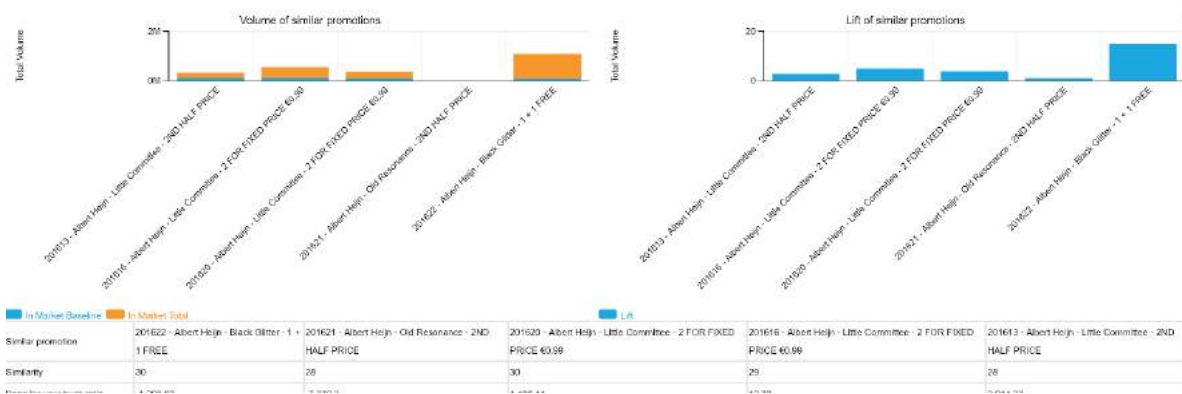
While copying a year plan you can automatically let all promotions re-select the best strategy or optimize from a zero base within set constraints



Or let the sales manager directly create the best ad-hoc promotions based on retailer opportunities

And communicate reliability

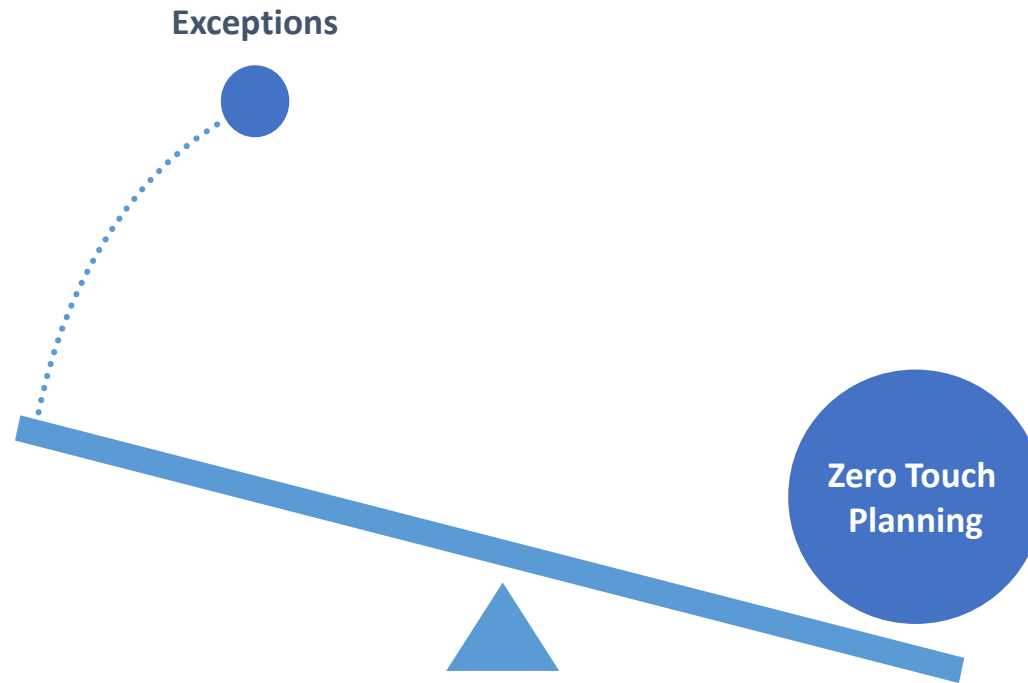
By looking at the most similar promotions in the past and comparing the real outcomes to predictions from the Machine Learning model, you can estimate the reliability



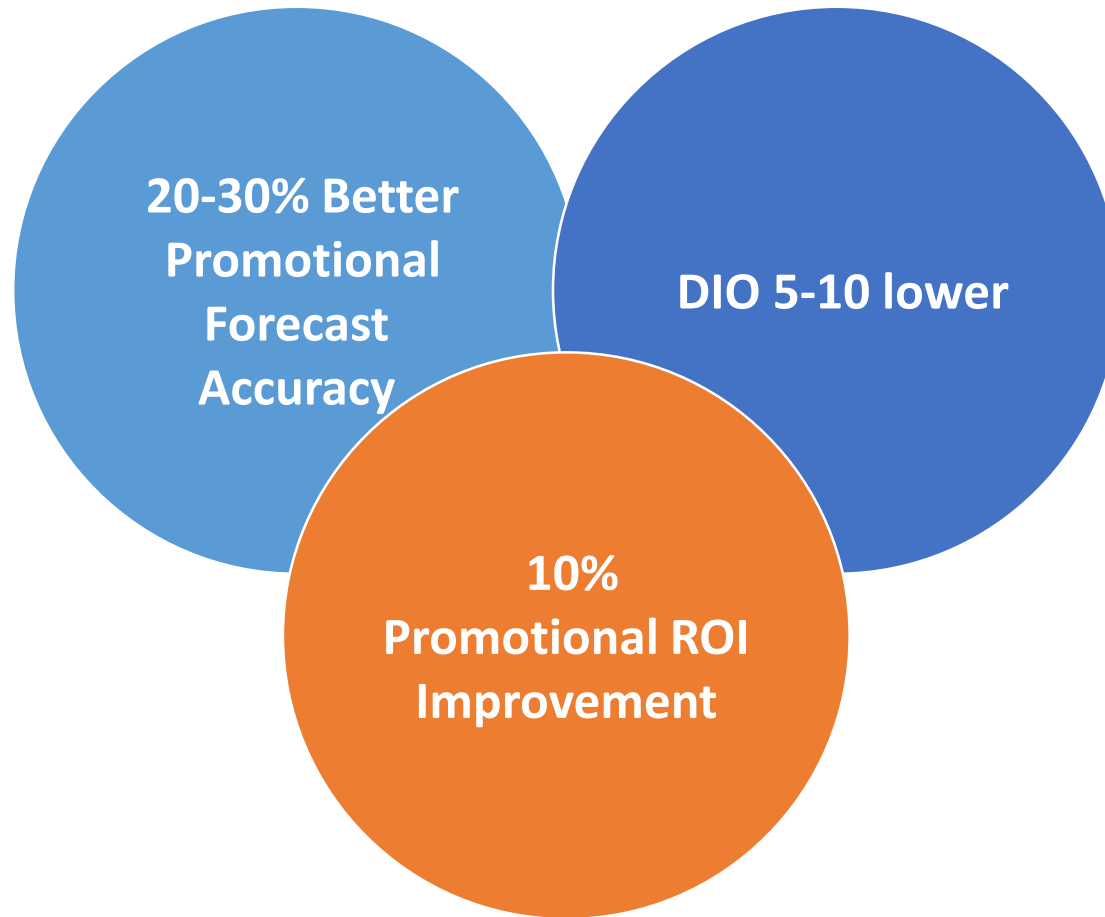
78% Reliability

The biggest problem with predictive analytics is that people tend to either not trust it at all or to trust it blindly

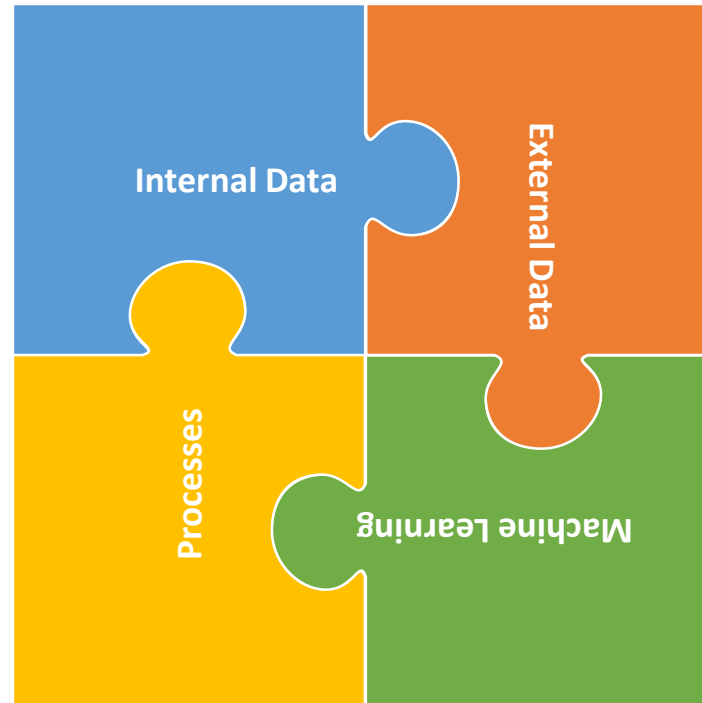
Spend your energy on the exceptions, not the mainstream



There is an incredible room for improvement



If you connect the pieces



And have the Key Enablers in Place

- Planning, Evaluation and Optimization must form part of a **single process** and system
- Modern, **predictive functionality** must be directly integrated into the work process of users
- The system must be able to handle **large amounts of data** (at least hundreds of millions of records)
- **Internal** and **External** data need to be cleansed and combined if available
 - If you do not have external data, your predictions might be a bit less accurate but your live might also be more easy
- Users must be presented **options** (scenarios) and given an idea of the **reliability**
- The tool must make **logistical** effects directly **financial** (ROI) and show the gains for both the manufacturer and the retailer
- **NPD** and **Displays** should be embedded in Baselines & TPM processes



The role of machine learning to significantly improve forecast accuracy

visualfabriq
Let's unleash your excellence

Questions?