Demand Planning Excellence

Using data, ML, and FVA

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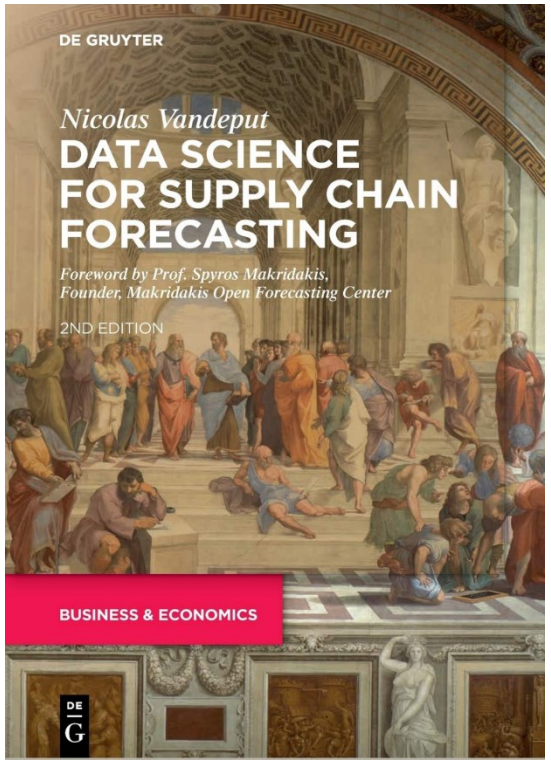

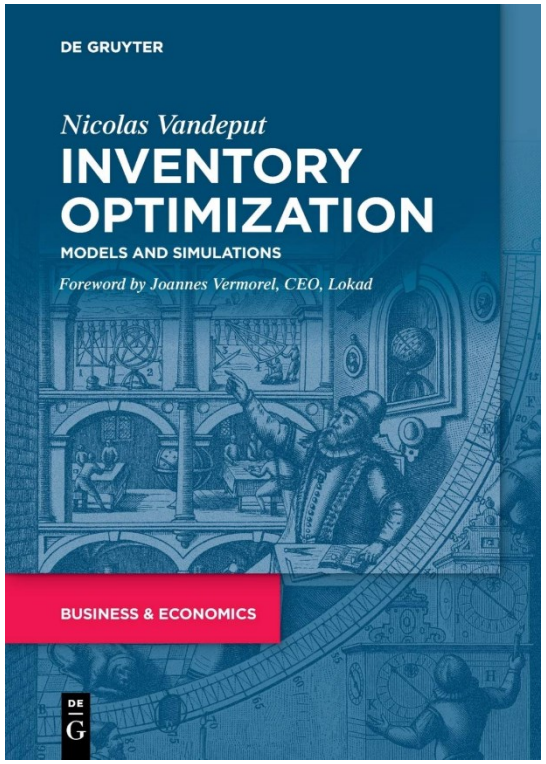

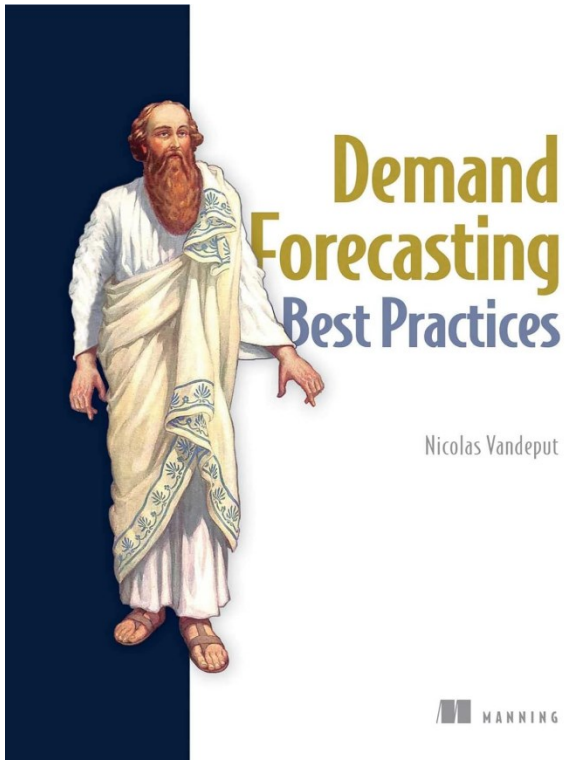

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Forecasting Accuracy Matters

For every 1% of forecast improvement, a consumer goods company could achieve a 2.7% reduction in finished goods inventory, a 3.2% reduction in transportation costs, and a 3.9% reduction in inventory obsolescence.

Gartner

From our experience, 15% forecast accuracy improvement will deliver a 3% or higher pre-tax improvement.

The Institute of Business Forecasting

Improving forecasting accuracy by 10 to 20% translates into a potential 5% reduction in inventory costs and revenue increases of 2 to 3%.

McKinsey Global Institute

Simulations showed that a 10% forecasting improvement would result in 6% shortage reduction or 4% inventory reduction.

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50% of planners' forecast reviews worsen accuracy, academics say.

How can we do better?

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How to participate?

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1 Go to wooclap.com

2 Enter the event code in the top banner.

Event code

LDBFAY

Enable answers by SMS

Copy participation link

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100 %

23

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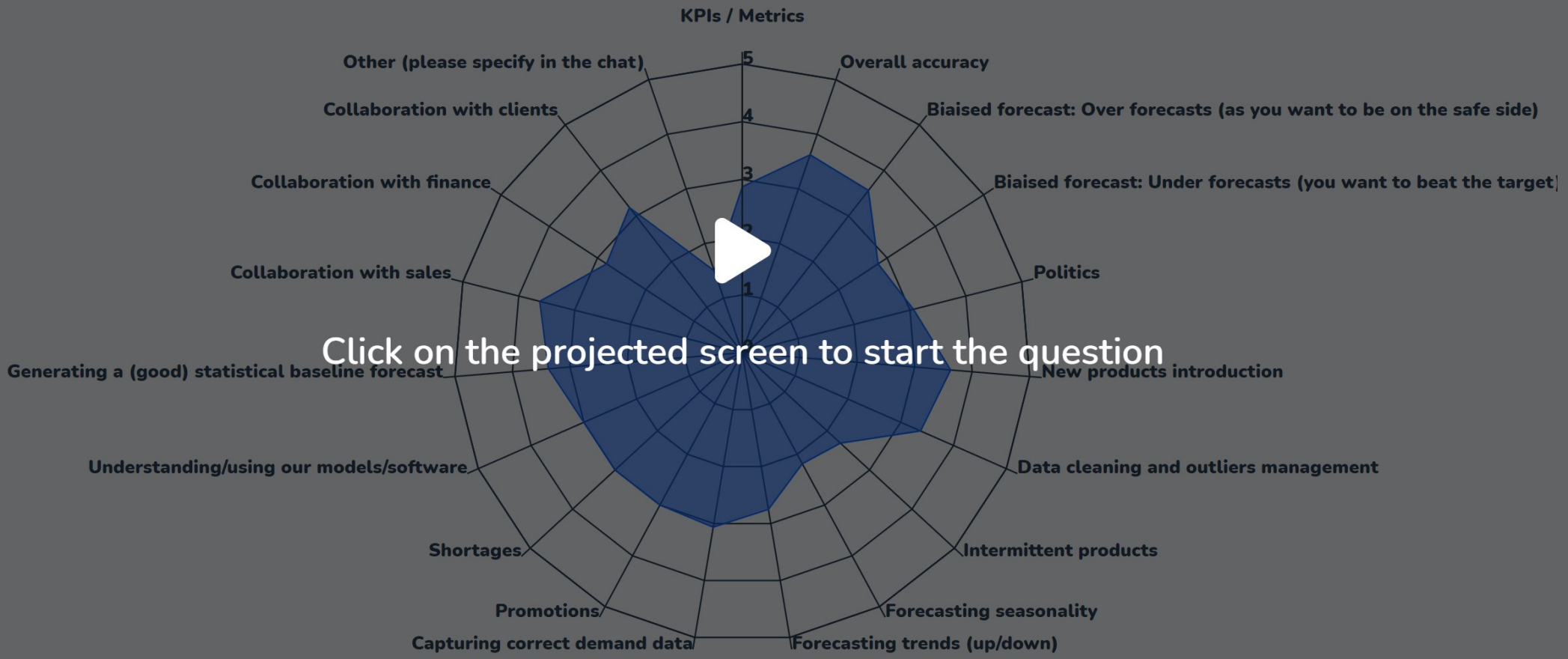
What are your current challenges/pain points?

0 We're good, thanks. ➡ 5 Critical pain points.



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Demand Planning Excellence

Efficacy

Forecasts support decisions

- Forecast unconstrained, unbiased demand, not supply-constrained sales
- Pick the right forecasting horizon and granularity.
- Use business-centric forecasting KPIs

Efficiency

Work smarter, not harder

- Automated bulletproof forecast engine
- Playing the information Game
- Tracking forecast value added

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Building Efficiency

Work smarter, not harder

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3 Key Practices for Building Efficiency

Forecasting as an
Information Game

Bulletproof Automated
Machine Learning

Tracking
Forecast Value Added

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Demand Drivers

Playing the Information Game

You cannot vote anymore

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Which demand drivers are impacting your business?

0 No impact → 5 Massive impact

1	Promotions	3.7	7	Clients: Sell-out/Consumption	3.5
2	Shortages	3.2	8	Clients: Current inventory levels	3.4
3	Pricing	3.1	9	Clients: Pre-orders	2.5
4	Ads	2.8	10	Clients: Contractual volume agreements	2.3
5	Weather	2.4	11	Macroeconomic	3.4
6	Competition: Pricing, promotions, new product ...	3.2	12	Other (specify in the chat)	1.7

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Demand Drivers and Data Availability

	History	Future
🛍️ Promotions	✅	✅
📦 Shortages	✅	✅ Assume none as we forecast unconstrained demand
💵 Pricing	✅	❌🤔
🌤️ Weather	✅	Short-term only
📊 Macroeconomic	✅	❌ You cannot forecast macroeconomic indicators ✅ Leading indicators
📦 Clients' sell-out/Inventory	✅	NA

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Bulletproof Automated Forecasting Engine

Using Machine Learning

How does the Machine Learn?

Machine Learning learns relationships between input **features** (inputs) and an **objective** (output).

When presented with new data, ML makes predictions based on these features.

The science and art of machine learning optimization are about 1 **feature selection** and 2 **tuning the algorithm's inner parameters**.

	Features Inputs						**Objective** Output
	Demand			**Segment**	**Price**		**Promotion**	**Demand**
	Mean 12m	Last 3m	Last m		Mean 12m	Last	Next month	Next month
Training	500	400	300	Budget	10€	10€		200
	1,000	750	500	Premium	35€	30€	-15%	700
	350	150	400	Normal	20€	20€	-20%	300
	110	120	150	Budget	8€	9€		120
	30	80	10	Budget	5€	5€		30
	250	220	240	Normal	15€	14€	-10%	260
Predictions	200	100	50	Premium	45€	40€		?
	35	20	40	Normal	18€	19€	-5%	?
	800	1200	600	Budget	10€	6€		?

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Bulletproof Automated Forecast Engine

Machine learning does it best

Bulletproof Automation

- You **need** to forecast demand at scale.
- Impossible to do it by hand.
- You need a forecast engine to process as many insights as possible **automatically**.
- You need a **bulletproof** forecast engine that uses business drivers.

Statistical Models

- Struggle to capture anything other than linear relationships.
- Struggle to extrapolate patterns from one product to another (think promotions or seasonality).
- Can't forecast new products.

Machine Learning

- Capture complex sales patterns.
- Forecast new products.
- Use business drivers.

How Good is Machine Learning?

Machine learning took over years ago

Forecasting Competitions

🏅 **Since 2018, all demand forecasting competitions have been won by machine learning.**

- 2018 Corporación Favorita. 200k items: Store x Product x 16 Day
- 2020 Walmart. 40k items: Store x Product x 40 Day
- 2021 Intermarché. 300k items: Store x Product x 90 Day

Projects

20 to 30% error reduction compared to benchmarks

- Manufacturer with promotions: 20% improvement
- Pharma distributor: 25% improvement
- Retailer with promotions and pricing: 30% improvement

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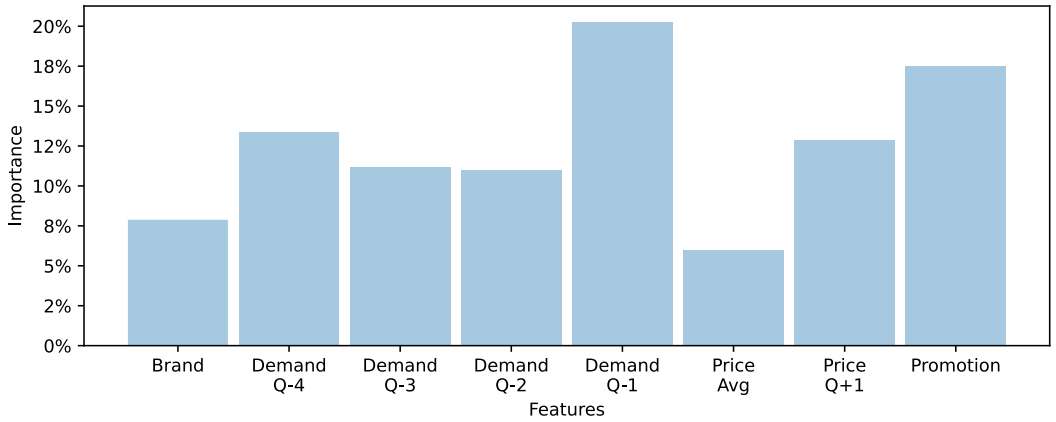
Demystifying the Black-Box

Feature Importance

Some models can compute *features' importance*: a value that indicates how important an input feature is when predicting an output.

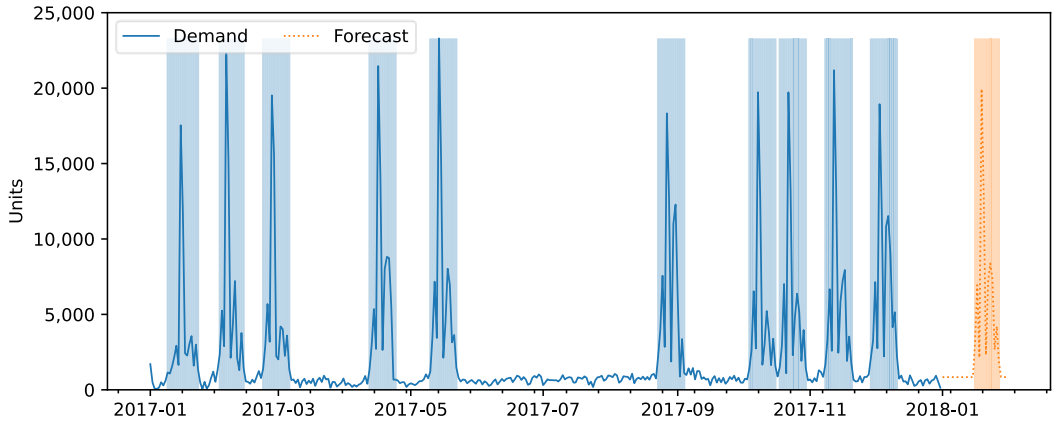
Just knowing that a feature like *promotion* is important doesn't tell the exact impact of running a promotion.
It simply means the model takes it into account.



Scenario Analysis

You can calculate the impact of various business drivers by running different forecast scenarios.

For instance, you might run two scenarios, one with promotions and one without.
By comparing the demand forecasts, you'll be able to discern the effect of running promotions.



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Machine Learning Eats Statistical Models for Breakfast*

*If you know how to use it.

Machine learning is not a magic bullet.
Simply plugging your demand data in a neural network won't work.

Using machine learning to forecast demand requires **feature engineering, careful model selection, and fine-tuning**.

In short, **you need specific savoir-faire**.
Otherwise, you'll barely beat moving averages.

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What Should Planners Do?
How to Play the Information Game

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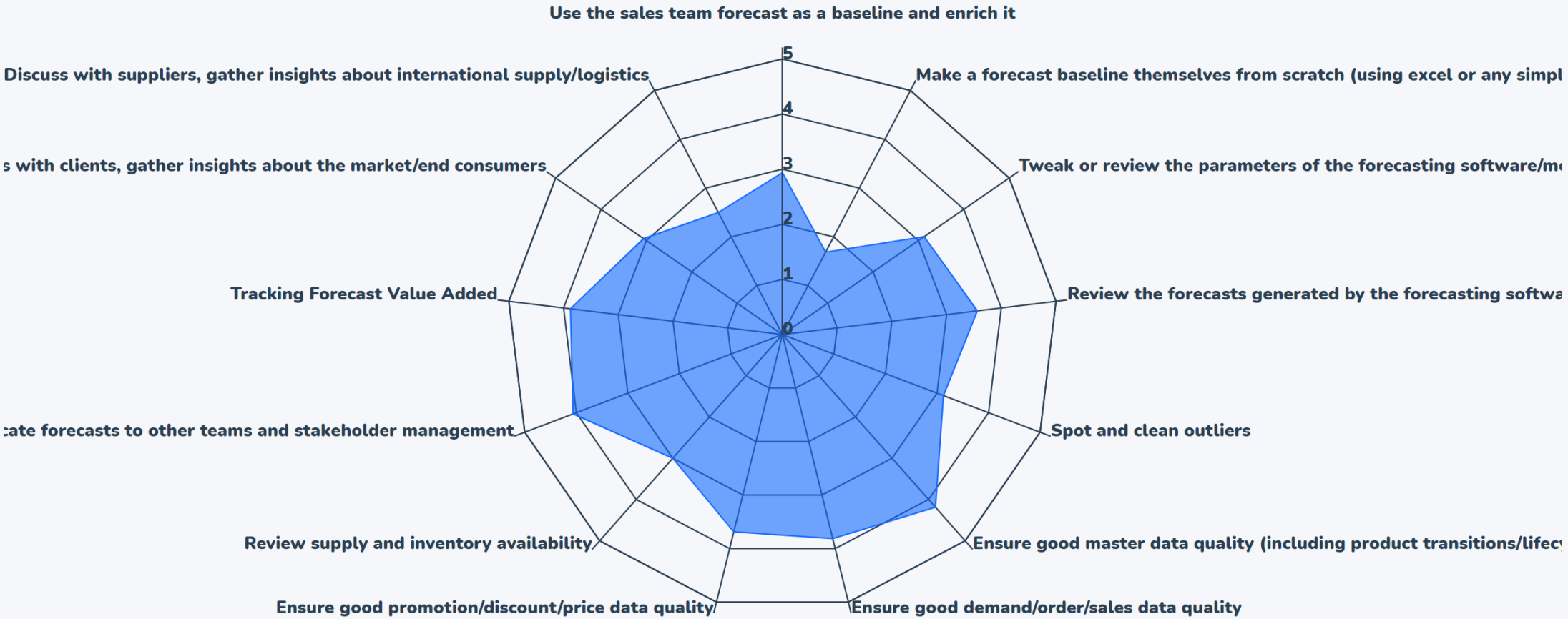
What are the main priorities of a demand planner?



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What Should Planners Do?

Clean Data

Ensure that all data fed to the model is correct.

Think master and transactional data.

Planners are Data Stewards

Collect Extra Insights

Gather insights **beyond** what is automatically fed into the machine learning engine.

Call your clients.
Talk to sales and marketing.

Planners are Investigators

Enrich Forecasts

When you know something, do something

If humans are aware of a piece of information that the forecast engine isn't aware of, they should enrich the forecast.

What if planners can beat the forecast engine without specific insights?

Your forecasting engine isn't bulletproof. (Data) scientists should improve it.

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What Should Planners Not Do?

Clean Outliers

Data cleaning (incl. error detection and cleaning) should be automated. Just as your forecasting engine.

Allowing planners to change historical values is an open door for data hacking.

Tweak Models

If you can manually tweak and improve a forecasting model, it means the model isn't bulletproof. Time to improve it.

Account for Supply

You should forecast unconstrained demand, not sales.

So, you shouldn't take supply and shortages into account when forecasting demand.

Planners are not statistical models

Demand forecasting is not supply planning

Which Products Should You Review First?

Don’t focus on products.
Focus on insights.

Review the products for which you have insights that your model isn’t aware of. *If you know something, do something.*

If you can beat your model without specific insights, it means the model needs to be improved.

50% of planners' forecast reviews worsen accuracy, academics say.

Improve this by tracking **Forecast Value Added** and playing the **Information Game**.

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Go to **wooclap.com** and use the code **LDBFAY**

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How Familiar are you with the "Forecast Value Added" (FVA) framework?

1	I never heard about it	0%	0
2	I might have heard about it, but not sure about the concept	0%	0
3	Familiar with the concept - [illegible]	0%	0
4	We are using it, but it's challenging	0%	0
5	We are using it, it's great!	0%	0

Click on the projected screen to start the question

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100 %

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Forecast Value Added

Does our forecast engine create value?

Do we add value?

No, we destroy value.

	Forecasting Model	Demand Planners	Sales team	Consensus Meeting
MAE	45%	43%	45%	45%
Bias	-3%	1%	5%	4%
Score	48%	44%	50%	49%
Added Value		+4 🟢	-6 🔴	+1 🟡

Do not give absolute accuracy targets.
Set added value targets

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Forecast Value Added

Does our forecast engine create value?

Do we add value?

Overall, we destroyed value.

	Benchmark	Forecasting Model	Demand Planners	Sales team	Consensus Meeting
MAE	52%	45%	43%	45%	45%
Bias	-1%	-3%	1%	5%	4%
Score	53%	58%	44%	50%	49%
Added Value		+5 🟢	+4 🟢	-6 🔴	+1 🟡

Do not give absolute accuracy targets.
Set added value targets

FVA highlights **problems**, promotes **ownership** and **accountability**.

How can we **help** stakeholders to enrich forecasts?

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