Revenue Management at Flix

and how to validate changes in the pricing automation pipeline

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FLiXBUS **FLiXTRAIN** *Greyhound* **KÂMiLKOÇ** 1926

Flix as a Tech Company

Flix is not that much of a bus company as it is a Tech company

**Our vision is
smart and green mobility for everyone
to experience the world.**

| Smart | Best value-for-money and most convenient booking |
Green	Eco-friendly green fleet with best green house gas balance
Everyone	Accessible to a very broad target group and millions of passengers
Experience	Love brand for great travel experiences across thousands of cities

To achieve that, there are a large number of tech solutions for Automation and Optimisation

Revenue Management department at Flix

GOAL: automatically offer the best price for every passenger, in real time and for the full network

Revenue
Management

Tech

Tech

Tech

Business
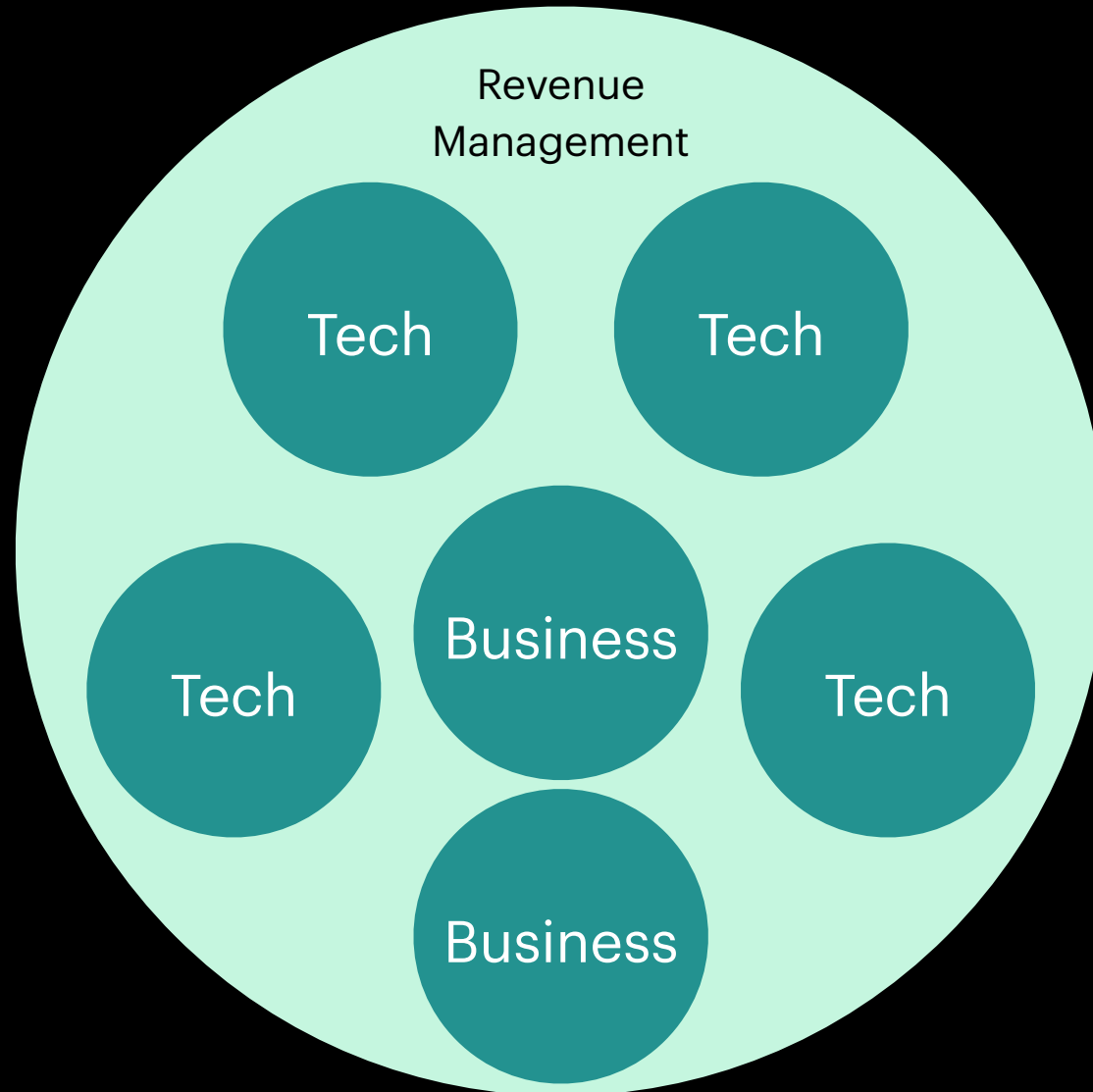
Tech

Business

- 4 Teach Teams + 2 Business Teams

- each with 5 to 10 members:
  - data scientists
  - data engineers
  - data analysts
  - product and business owners
  - agile coaches
  - people managers

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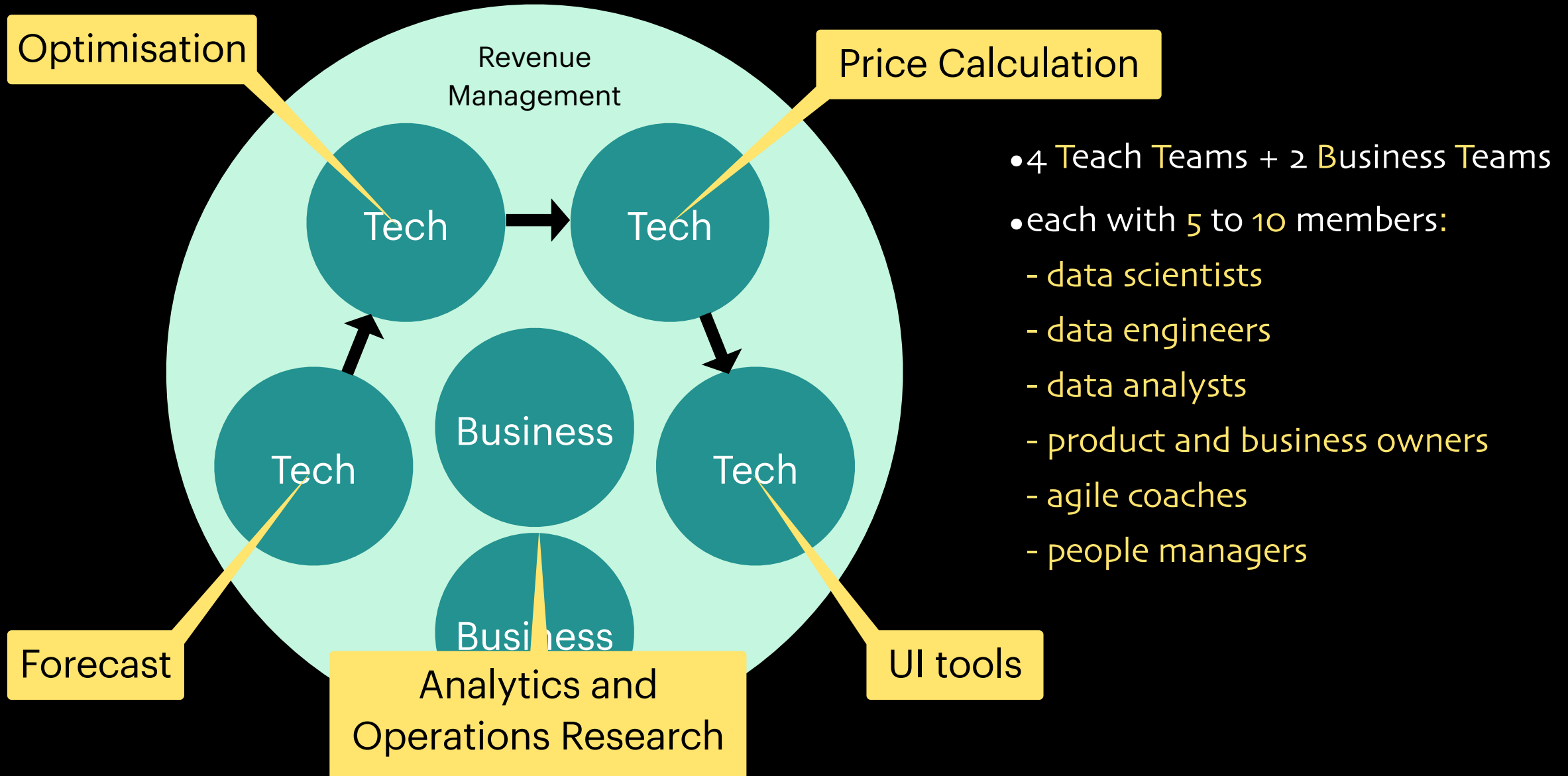
Flix Network:
the scale of our problem

FLiX

The scale of our problem

#1 in **Europe** as the only pan-american network

#1 in **North America** Flix acquired Greyhound

Growing in **India** *Launched 06-Feb-2024*

Coming soon to **Mexico**

Growing in **Chile** and **Brazil**

#1 in **Türkiye** and consolidating the market

The scale of our problem

#1 in **Europe** as the only pan-american network

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Launched 06-Feb-2024

#1 in **North America**
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Coming soon to **Mexico**

🌐 **44** countries	🗺️ **5,600+** destinations	🚌 **5,500+** FlixBuses on the road	🚆 **10+** FlixTrains on the rail

Growing in **Chile** and **Brazil**

#1 in **Türkiye** and consolidating the market
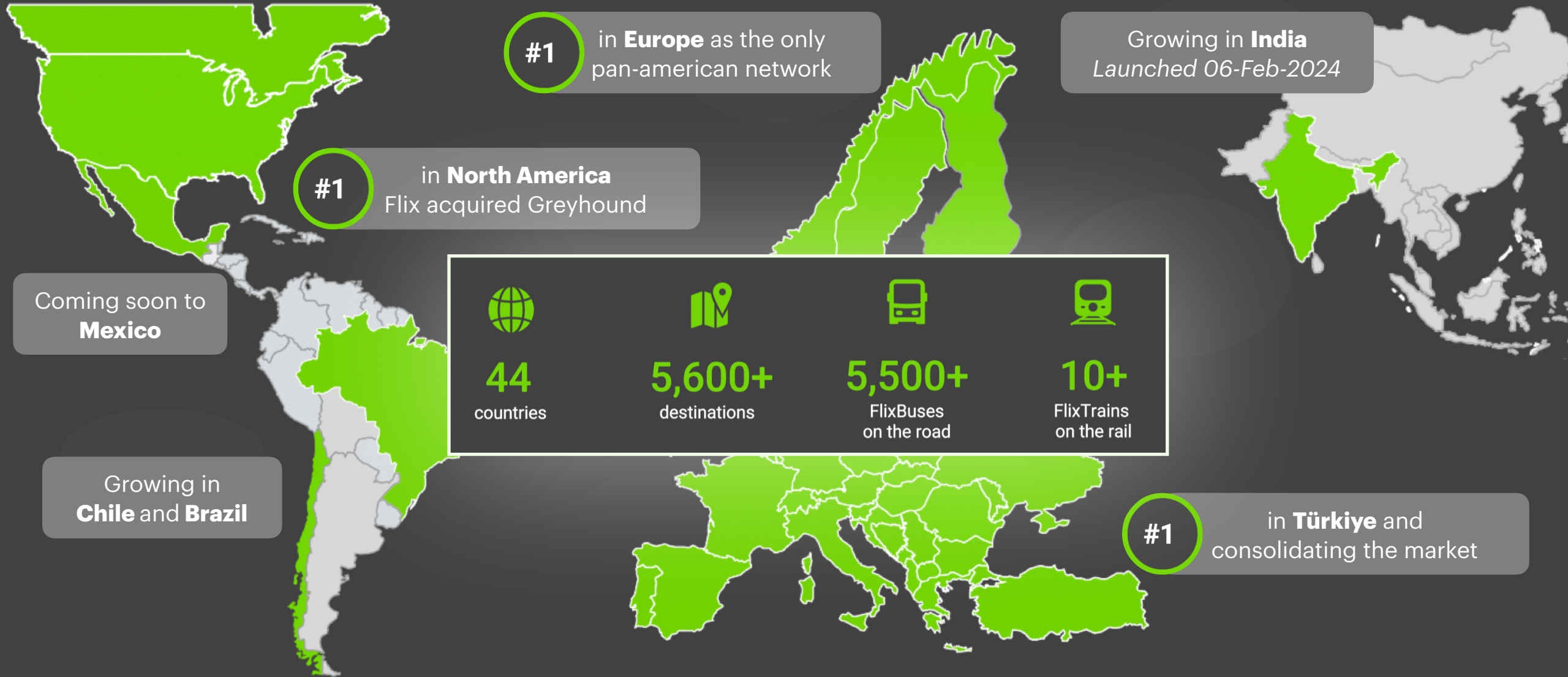
Challenge: build a pricing automation solution with a focus on scalability

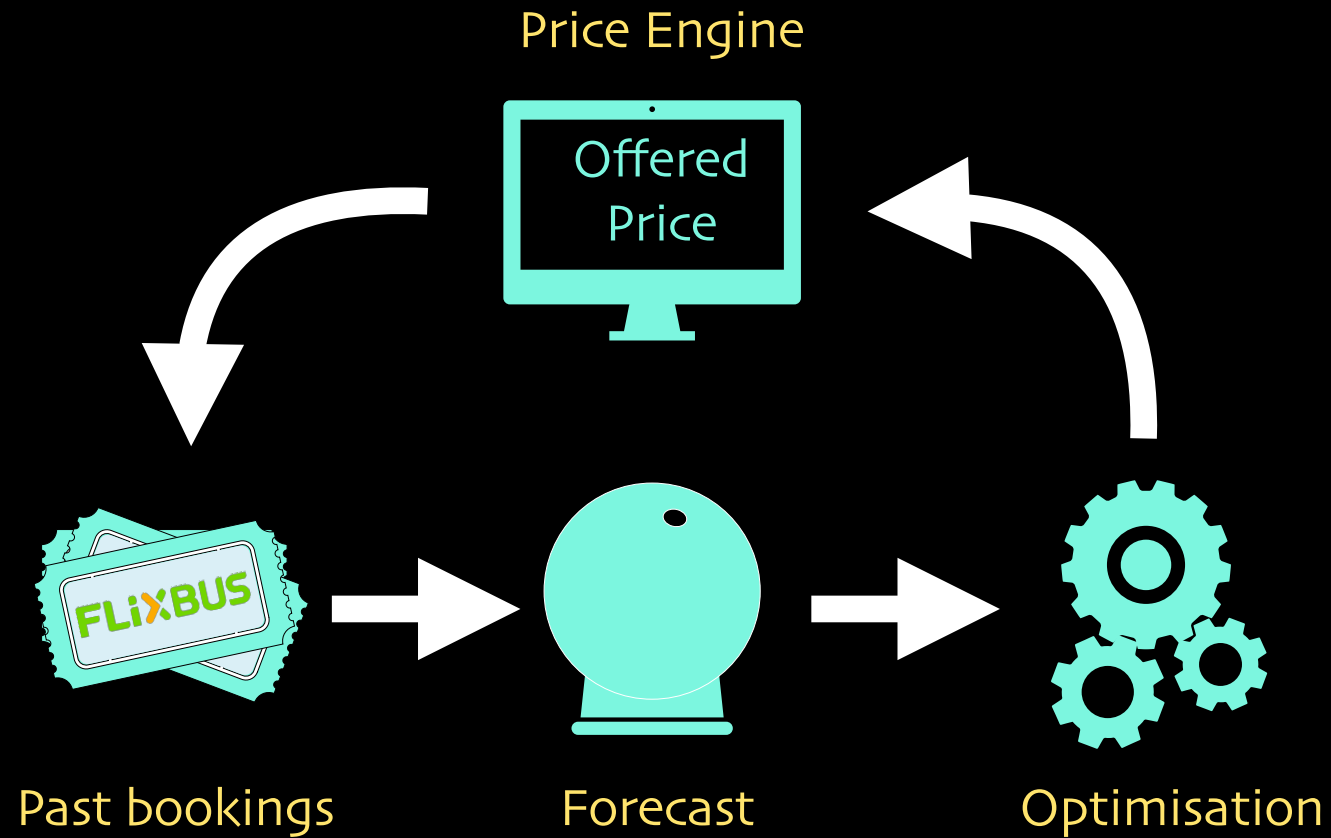# Pricing automation at Flix

Revenue Management System (RMS)

100%
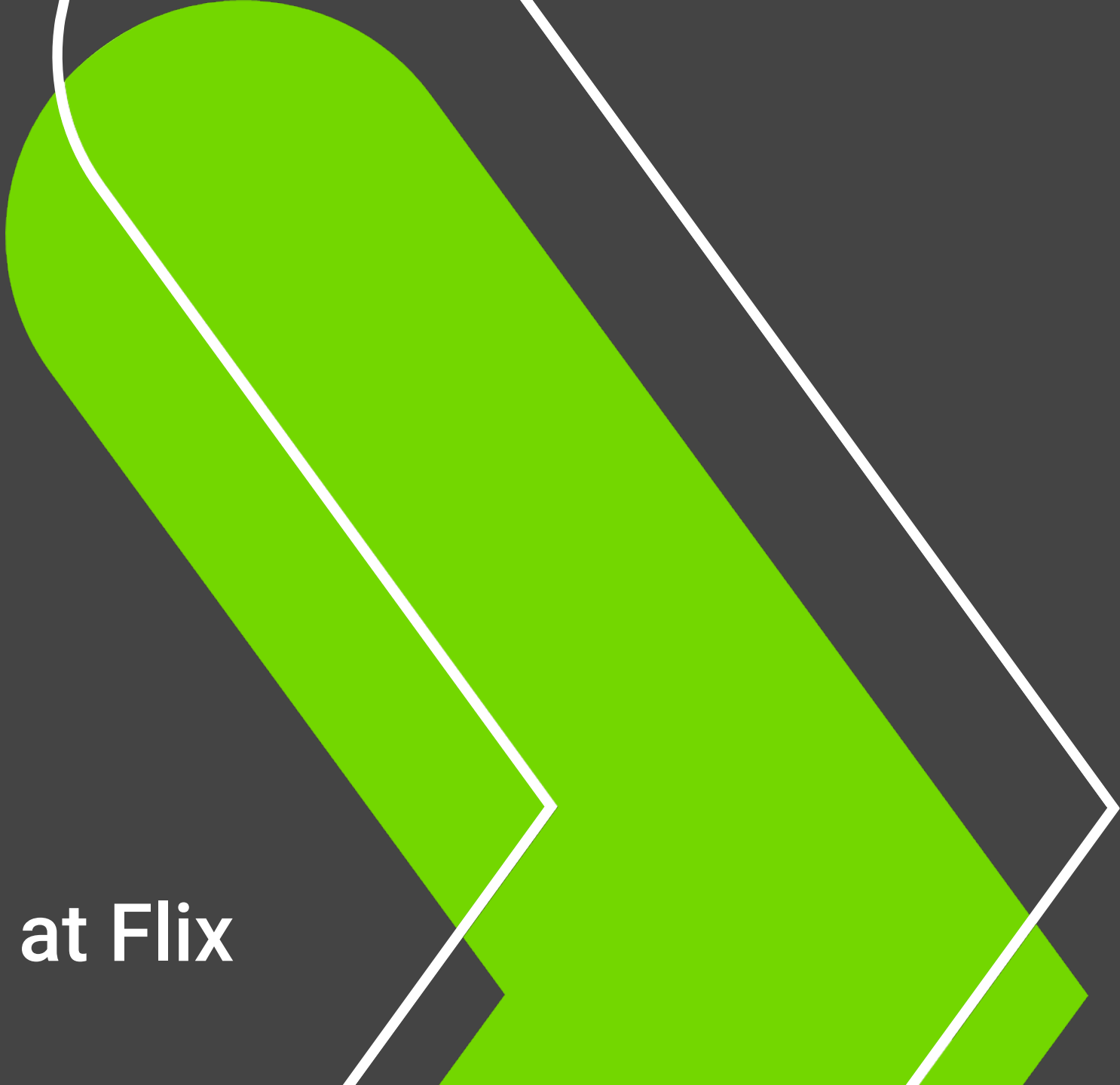
Revenue
Share
in
Automation
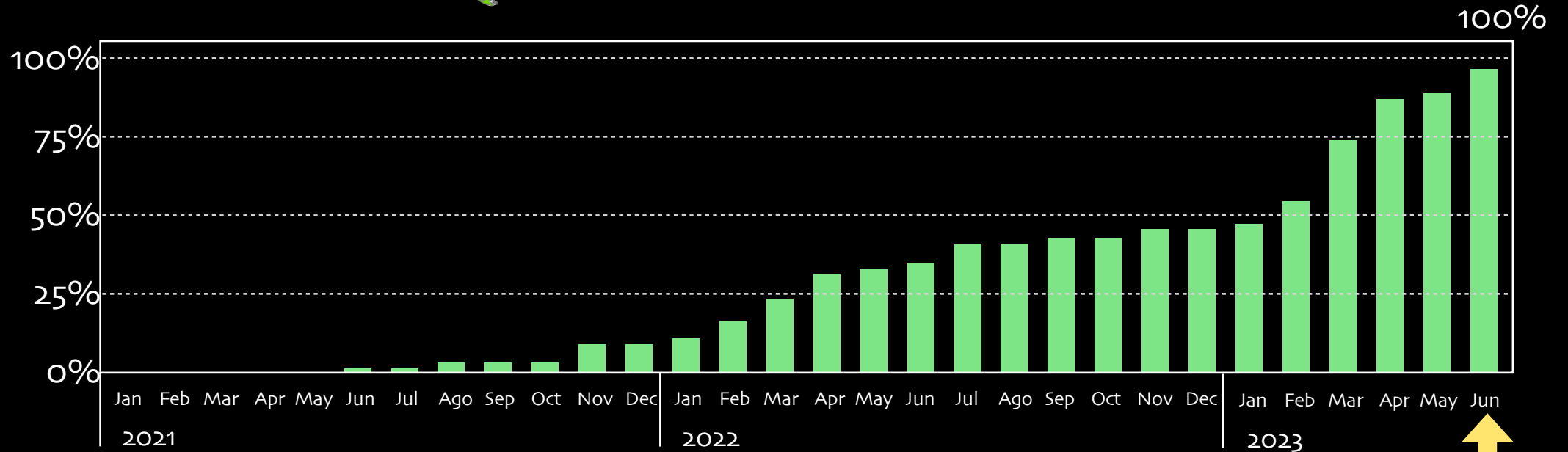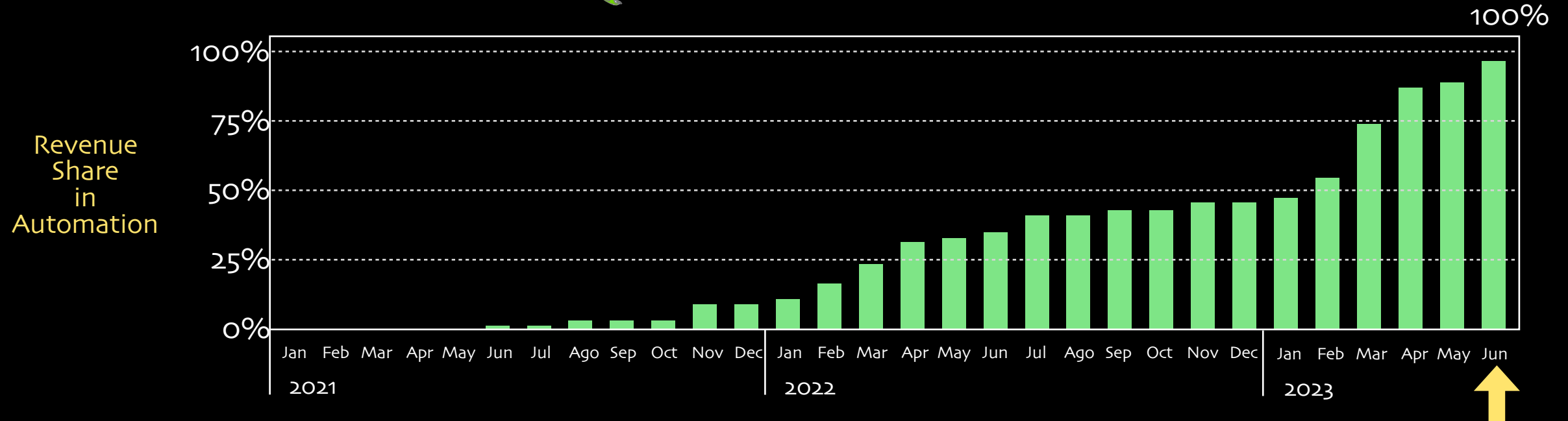
	2021	2022	2023
	Jan Feb Mar Apr May Jun Jul Ago Sep Oct Nov Dec	Jan Feb Mar Apr May Jun Jul Ago Sep Oct Nov Dec	Jan Feb Mar Apr May Jun

Revenue Management System (RMS)

Price Engine

Offered Price

Past bookings

Forecast

Optimisation

Forecast

HISTORICAL SALES
for a connection Origin-Destination

Sold
Tickets

Jan   Feb   Mar   Apr   May   Jun   Jul   Ago   Sep   Oct   Nov   Dec
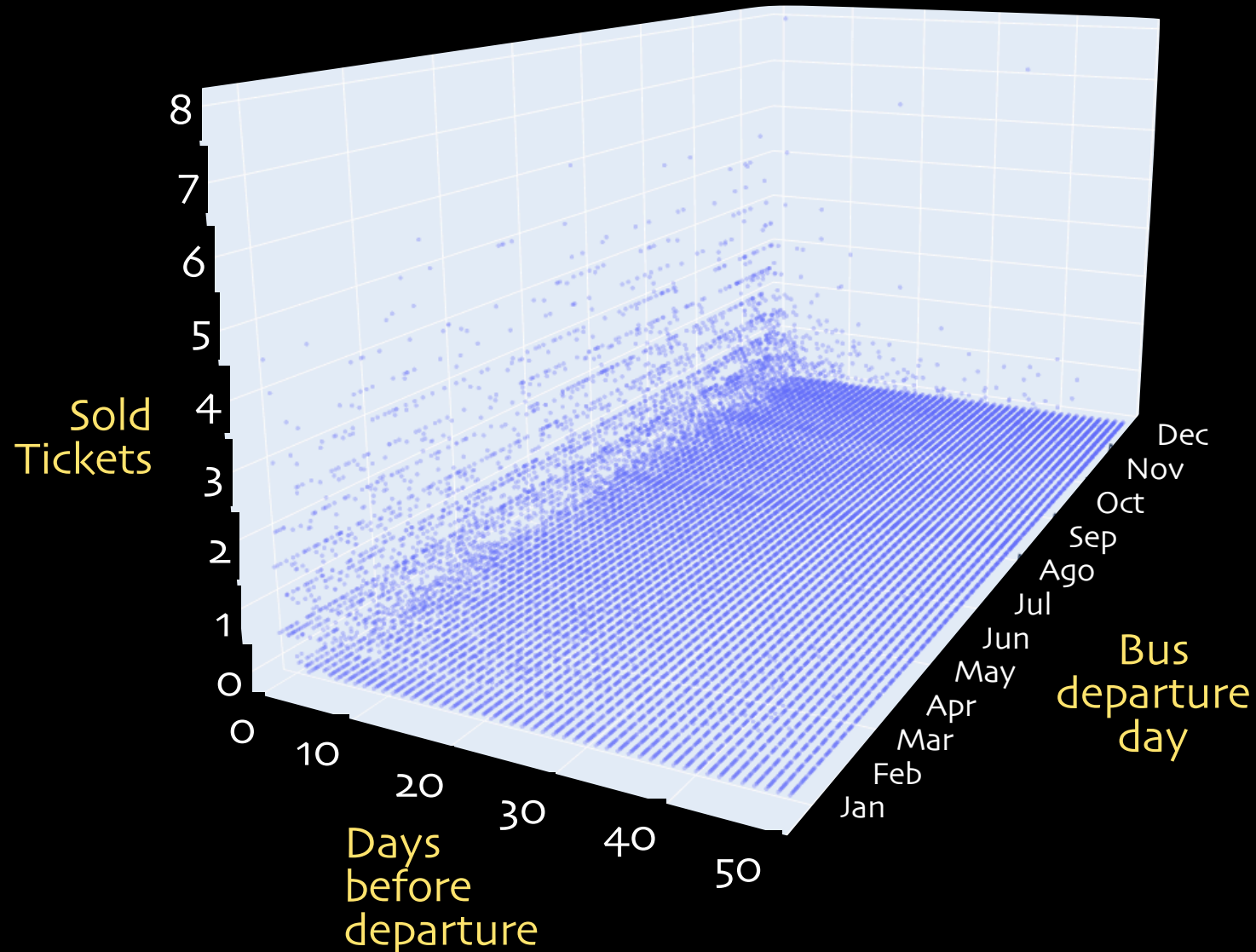
Bus departure day
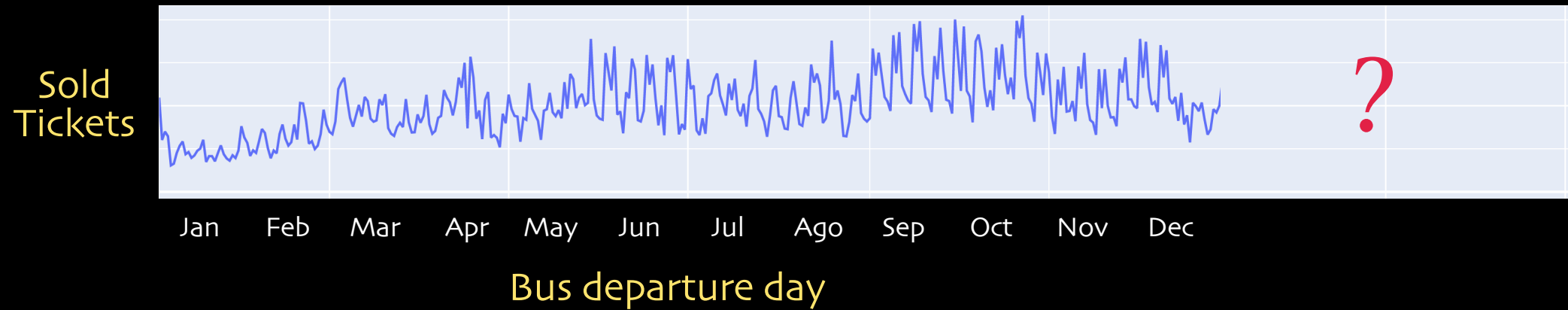
Should we use classical Time Series analysis?

NO

Forecast

HISTORICAL SALES
for a connection Origin-Destination

- We need a model that:

  - contemplates the dimension
    Days before departure
    (needed for optimisation)

  - can learn from
    multiple connections at once
    (good for generalisation)

- We opt for a tabular
  Machine Learning approach

Machine Learning approach

Features (X)   Target (y)

Observed
sales
over the
last
400 days

Features (predictors):

- price

- calendar (for seasonality)

- connection (origin and destination)

- days before departure

- how many sales so far

Target:

- demand (~ tickets)

Demand

D decays
exponentially
with P

Constrain
during
learning

Price

Forecast Output

Granular

predictions are provided for every **ride-city connection-prebooking period**

Universal

same approach for the **entire network**

Scalable

the application runs regardless of the size of the **network**

Exponential Demand Curve

is assumed, for which the **price dimension** is learned separately.

Tabular Machine Learning

(**tree-based algorithms**) to accommodate the high diversity and the non-linearities of the data

Tailored for Price optimisation

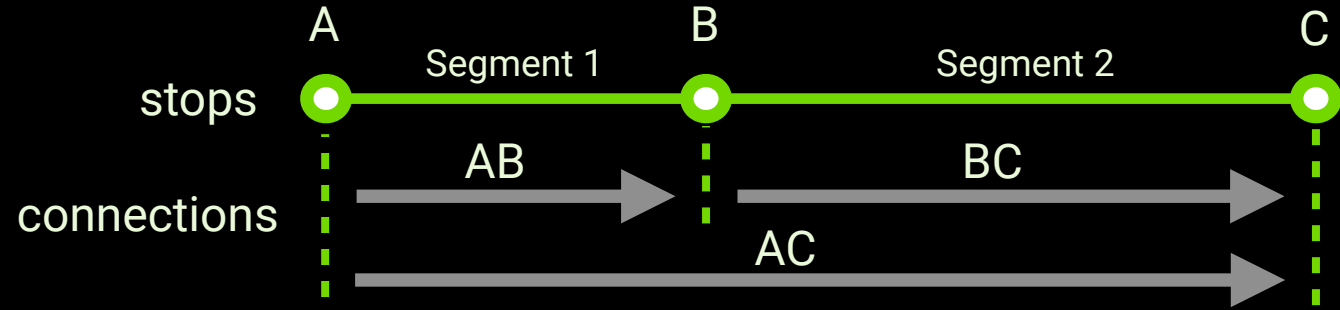to compute the **revenue optimized prices** at any given time

D decays exponentially with P

Demand

Price

Constrain during learning
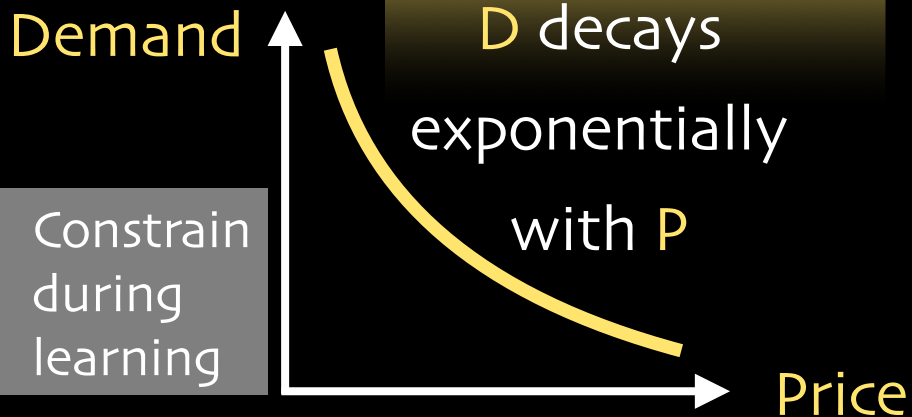
$$D(p) = D_0 \exp\left(1 - \frac{p}{p_0}\right)$$

Optimisation

- Per ride
- Recomputed every day
- Also upon network changes or unexpected demand changes

A   B   C

stops

Segment 1   Segment 2

connections

AB   BC

AC

Machine Learning

LOOK UP TABLE

For every connection and every time before departure, estimates of:

- Number of customers
- Their Willingness to pay

Deterministic Linear Program

Forecast

Optimisation

LOOK UP TABLE

For every remaining capacity in every ride segment:

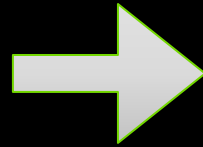- Bid prices per segment
- Minimum price per connection

FLiX

Validation of changes
in the
pricing automation system

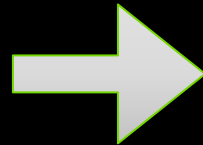# Validation of changes in the Pricing automation system

2 types of changes:

The aim is:

Pipeline Refactoring, Maintenance

→ … to proof that the change leaves revenue unharmed

Experimental Pricing Policies

→ … to proof that the change brings a revenue uplift

All methods rely on defining CONTROL and TREATMENT groups, and compare their revenues.

# defining CONTROL and TREATMENT groups

3 types of experiments:

| TYPE OF EXPERIMENT	CONTROL vs TREATMENT SPLIT	The new version of the pipeline (treatment) applies to...
Partial Roll Out	Geographical	a representative subset of the network
Chessboard Test	Temporal	rides departing in alternate dates
AB Test	Customers	a randomly chosen subset of customers buying tickets

Bayesian analysis of the Revenue Uplift

Ideally, only the PRICING POLICY changes between
CONTROL and TREATMENT
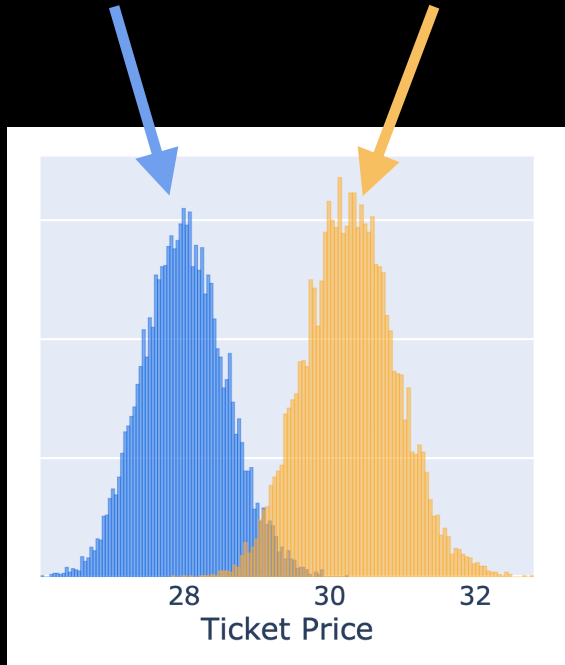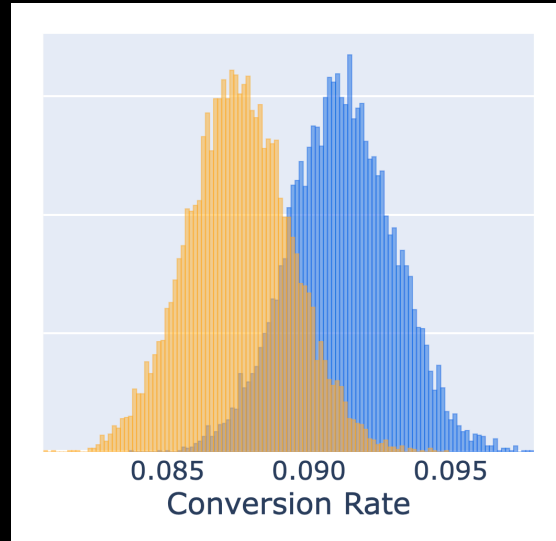
GAMMA distributed   BETA distributed
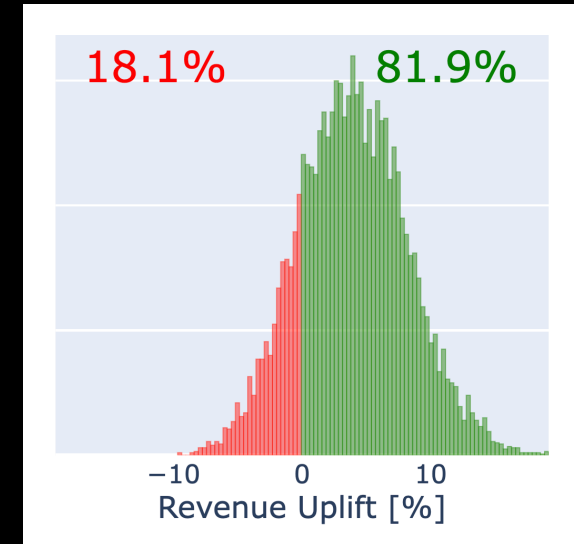
$$uplift = \frac{R\,treatment - R\,control}{R\,control}$$

Main TAKEAWAYS

Flix is a **Tech** company in **hyper growth** mode. Automation in Revenue Management is key.

Scalable Pricing Automation engine based on a Machine Learning **Forecast** and Ride Revenue **Optimisation**.

Statistical methods to properly evaluate revenue impact of any change in the automation pipeline.