Seizing the business potential of Vendex

Section A1 – Group 5

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Executive summary

01 | Vendex, a leading vending services company in Europe with a yearly turnover of **€984 M** provided a dataset of **1.8 M transactions** from **2,495 vending machines.**

02 | Out of 11 potential levers to optimize prices and operations, **country expansion, top-performers and bundling** have been selected for further analysis based on their impact, associated risks and ease of implementation.

03 | An inital expansion to four desirable locations in Barcelona leads to **€0.8M profit surge**, which corresponds to a **7% increase** in profitability during the next 5 years.

04 | Ensuring top-performers to be present in every machine, **would increase daily items sold by ~1000 items,** corresponding to a **profit increase of 3.5%.**

05 | Introducing **bundling** would further **increase profits by ~€186,000 (6%).**

06 | **Short-term recommendation:** leverage assortment levers.
Long-term recommendation: build a meaningful relationship with Vendex customers through VendexGO and make use of most attractive expansion opportunities in Barcelona.

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Agenda

General Overview

Optimization levers

Action plan
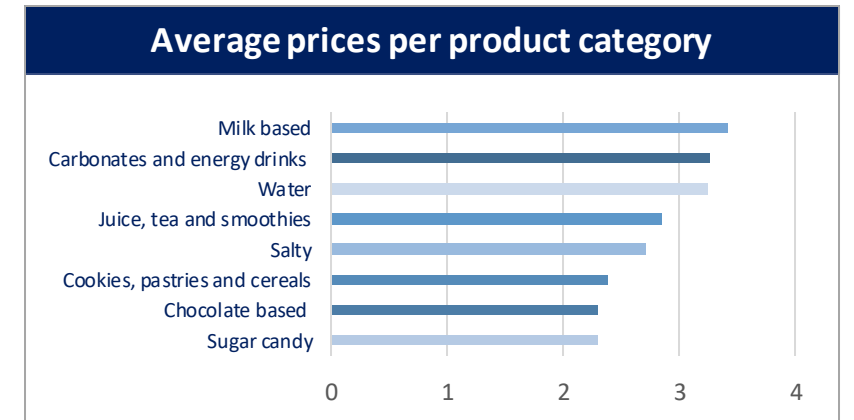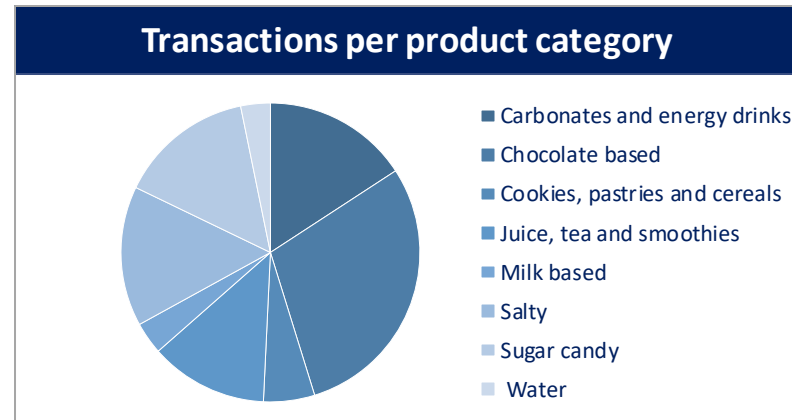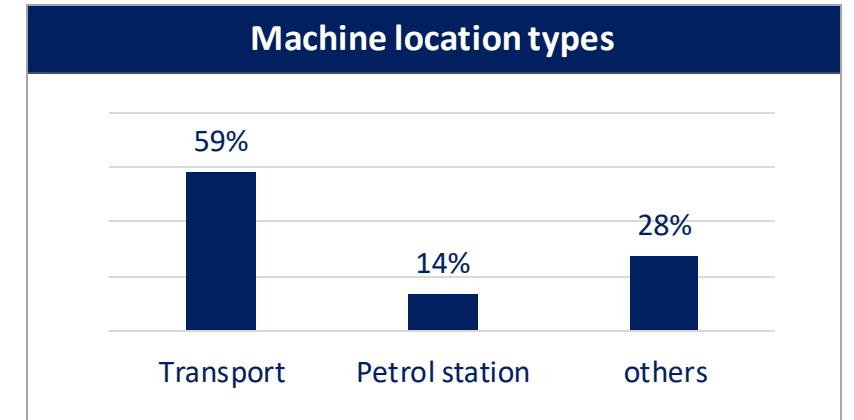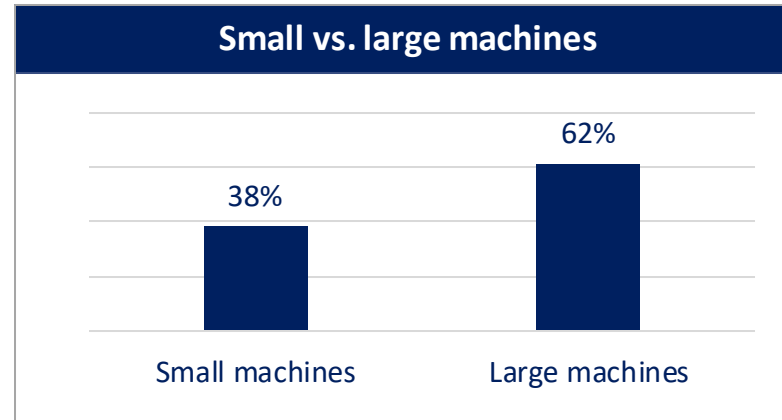
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Vendex dataset consists of more than 1.8 M transactions that correspond to ~2.5 K vending machines

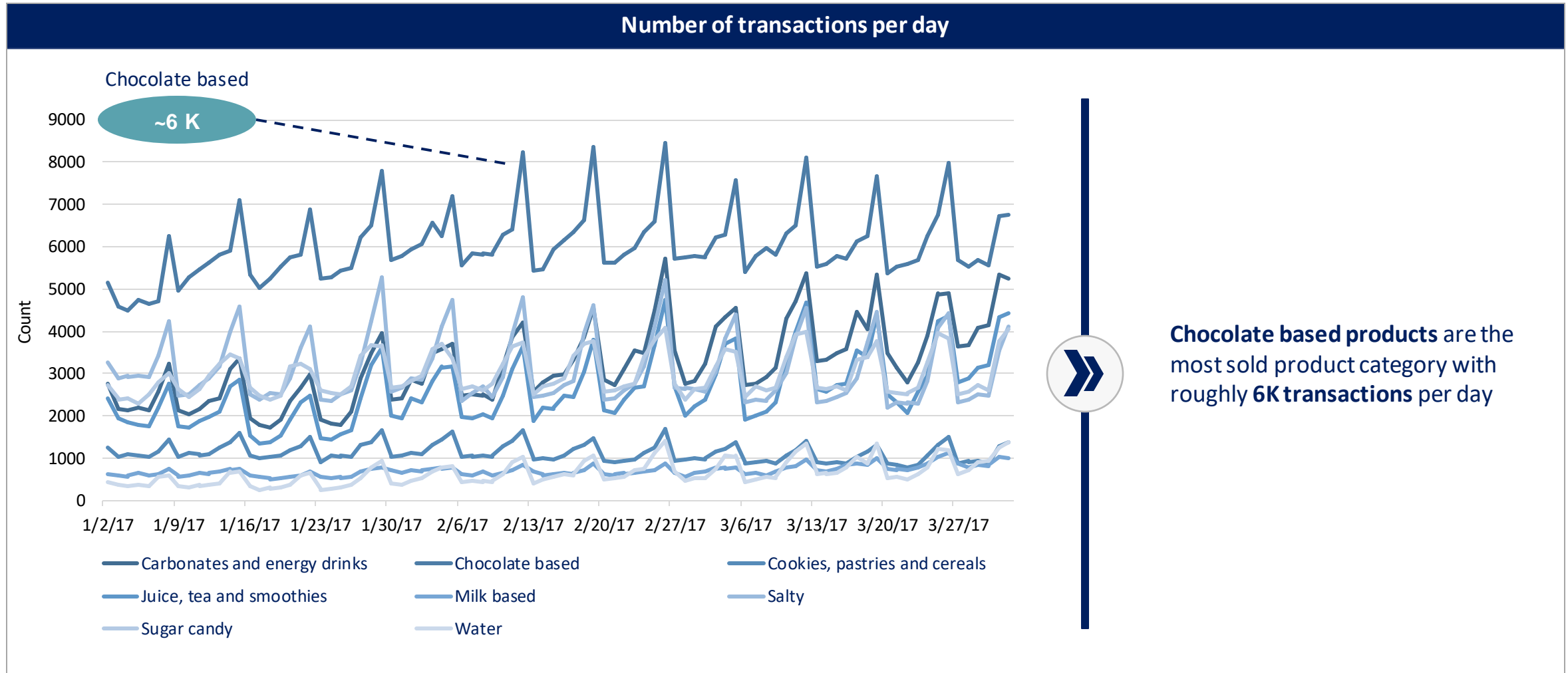**General overview (1/3)**

DESCRIPTION

- Leading vending and coffee services company in Europe, with a **turnover of €984 M** in 2017

- **Annual profit**: ~€12.5 M

- Sample of transactional data of **~2.5 K machines** from January until April 2017

- An average of ~**730 transactions per machine** during the period (8.6 daily), which implies more than **1.8 M transactions in total**

- Machines offer **water, drinks and snacks**

- Assortment of **63 different products** and **8 categories**

TRANSACTIONAL AND MACHINE INFORMATION

Small vs. large machines

Small machines	Large machines
38%	62%

Machine location types

Transport	Petrol station	others
59%	14%	28%

Transactions per product category

- Carbonates and energy drinks
- Chocolate based
- Cookies, pastries and cereals
- Juice, tea and smoothies
- Milk based
- Salty
- Sugar candy
- Water

Average prices per product category

Milk based
Carbonates and energy drinks
Water
Juice, tea and smoothies
Salty
Cookies, pastries and cereals
Chocolate based
Sugar candy

(scale: 0 1 2 3 4)

Machines sold an average ~20 K items per day with high variations depending on the product category

General overview (2/3)

Number of transactions per day

Chocolate based ~6 K

Chocolate based products are the most sold product category with roughly **6K transactions** per day

Legend: Carbonates and energy drinks · Chocolate based · Cookies, pastries and cereals · Juice, tea and smoothies · Milk based · Salty · Sugar candy · Water

Machines sales peak on weekends as well as around 04.00 and 10.00 pm per day

General overview (3/3)

Agenda

General overview

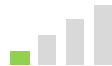**Optimization levers**

Action plan

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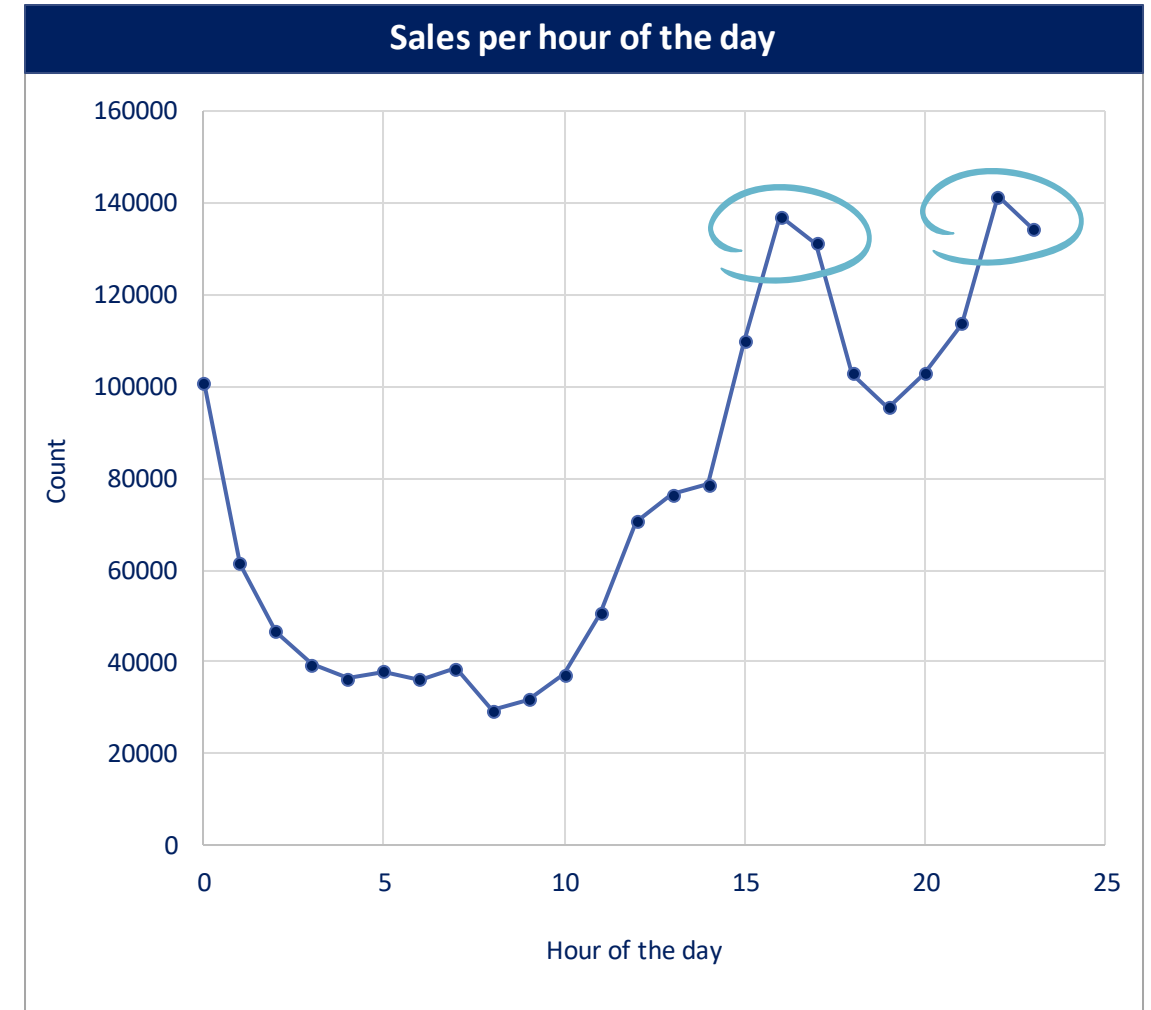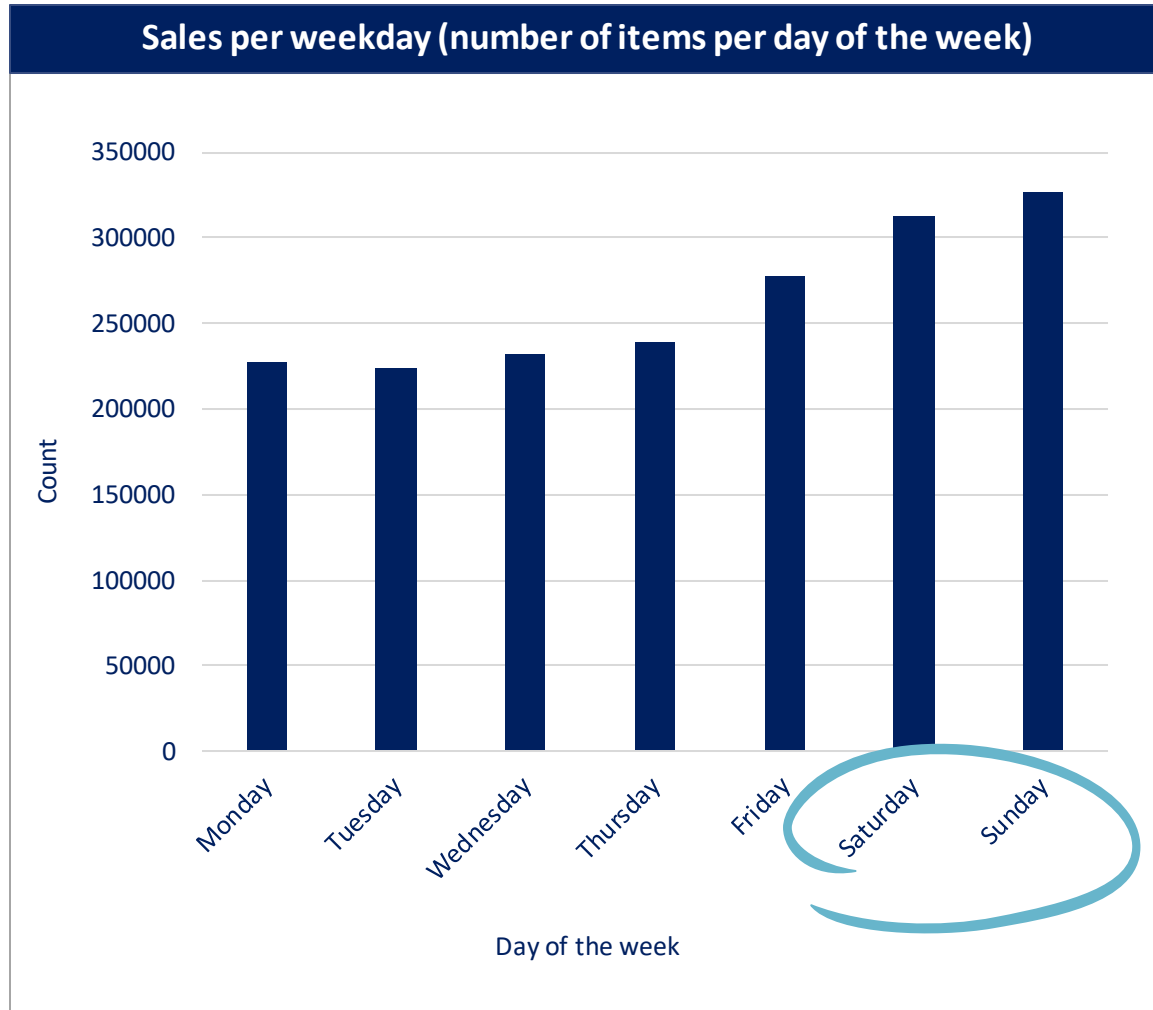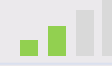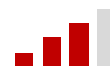
Based on impact, risk and implementation ease, country expansion, bundling and top performing products were selected for further analysis

Optimization levers overview

	Lever	Description	Impact	Risk	Implementation
📍	**Location evaluation**	Review illumination, placement, etc. of worse performing machines based on location desirability score			Easy
	Swapping machines	Swap big and small machines			Easy - Medium
	Country expansion	Expansion to countries with higher potential according to location model			Hard
🍶🍬	**Assortment expansion**	Include additional, new products to expand the assortment			Medium - Hard
	Top performing products	Guarantee that top performer products are present in all machines, substituting worse performers when needed			Easy
	Product bundling	Create "menus" or bundle products of products that are often taken together			Easy
€	**Discounts**	Give discounts of products bought together			Easy
	Dynamic pricing	Introduce different prices in different type of machines based on characteristics like location, tourism, time, stock etc.			Medium
⚙️	**Cashless machines**	Introduce cashless in the machines			Hard
	Stock-out analysis	Analyze when products are sold out and optimize restocking operations			Medium
	Warning system	Anticipate broken machines with an alarm-based Early Warning System (EWS)			Medium

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Four location features impact sales of machines

Optimization lever: Location

A linear model was built that creates a location score to predict average daily items sold per machine depending on the location where it is placed.

IDEAL LOCATION

Transport routes
A lot of transport routes within a radius of 600m to a vending machine **increase** daily sales by 1.7 items.

Hotels nearby
Having 4 and 5 star hotels in the area **increases** sales by 0.34 items per day.

Daily passengers
A higher number of passengers can **increase** daily sales by 3.3 items.

Nearby machines
Nearby machines within 300m proximity, on average, **decrease** sales by 0.11 items.

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An inital expansion to four desirable locations in Barcelona leads to €0.8M profit surge

Amsterdam

Barcelona

Global city desirability score

Amsterdam — 76,4

Barcelona — 128,7

Initial expansion to Barcelona

Global station desirability score

Assumptions	
Average margin	0.64
Cost of new machine	€3,000
New machines Pl. Catalunya	28
New machines Gràcia	22
New machines França	20
New machines Sants	20

Profit calculation

	Year 1	Year 2	Year 3	Year 4	Year 5	TOTAL
Profit Pl Cat	-1.455,10 €	82.544,90 €	82.544,90 €	82.544,90 €	82.544,90 €	328.724,48 €
Profit Gracia	-13.066,24 €	52.933,76 €	52.933,76 €	52.933,76 €	52.933,76 €	198.668,80 €
Profit Fraça	-16.597,12 €	43.402,88 €	43.402,88 €	43.402,88 €	43.402,88 €	157.014,40 €
Profit Sants	-17.765,12 €	42.234,88 €	42.234,88 €	42.234,88 €	42.234,88 €	151.174,40 €
Total	**-48.883,58 €**	**221.116,42 €**	**221.116,42 €**	**221.116,42 €**	**221.116,42 €**	**835.582,08 €**

Initial	Final	Change
12.447.580,42 €	13.332.046,08 €	7,11%

NPV becomes **positive in Yr2**

In 5Yrs investment horizon profits **boost by 7%**

Important assumptions:
1. we neglect the utilityl cost, since it is comparably minor amount.
2. average sale of vending machine remains constant in 5 years.

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Efficiency score and presence uncover unused potential and suggest opportunities to improve product mix

Product efficiency:
- Product efficiency is defined as the daily sales of product standaridized by average daily sales of a product in the category / (machine, if drink or snack)

Product presence:
- Product presence is defined as the percentage of machines with at least one sale of the given product

Product	Category	Type	Efficiency	Presence
sport_energy_drinks_1	Carbonates and energy drinks	drink	2.54	0.998
fruit_juices_1	Juice, tea and smoothies	drink	2.38	0.998
unflavoured_carbonates_1	Carbonates and energy drinks	drink	2.36	0.615
sugar_confectionary_incl_gums_1	Sugar candy	snack	2.01	0.996
chocolate_based_1	Chocolate based	snack	2.00	0.99

Unflavoured carbonates 1 are among the Top 5 performers, yet they are only available in **~62%** of the machines

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Replacing low-performers with top-performers keeps category mix while boosting profit by 3.5%

Optimization lever: Top performers

	Top 5	Worst 5
Snacks	sugar_confectionary_incl_gums_1, chocolate_based_1, chocolate_based_2, sugar_confectionary_incl_gums_7, chocolate_based_3	bakery_and_pastries_6, chocolate_based_11, bakery_and_pastries_3, sugar_confectionary_incl_gums_5, bakery_and_pastries_4
Drinks	sport_energy_drinks_1, fruit_juices_1, unflavoured_carbonates_1, tea_and_coffee_based_1, tea_and_coffee_based_2	flavoured_carbonates_5, unflavoured_carbonates_4, fruit_juices_2, flavoured_carbonates_4, tea_and_coffee_based_5

➢ We recommend to replace the five worst by the five best product performers within snacks and drinks that are not present in the respective machine

➢ **1 item per machine** needs to be exchanged on average, which suggests that the **worst performing product** in each machine is **replaced by the best performing product** that is currently missing

Category	Additional items sold	Profit gain
Snacks	835	241,126.7
Drinks	260	196,152.9

Annual profit increase

+3.5%

Top-performer products **increase** profit by 3.5%

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Introducing product bundling boosts annual profits by up to 6%

Optimization lever: Bundling

Price sensitivity models have revealed certain product bundles sufficiently increase sales of all items with a combine set discount.

Top 5 - Bundles	
Bundle 1	water_(flavoured)_1 & bakery_and_pastries_1
Bundle 2	milk_and_milk-based_3 & bakery_and_pastries_2
Bundle 3	water_(flavoured)_2 & bakery_and_pastries_1
Bundle 4	milk_and_milk-based_4 & bakery_and_pastries_1
Bundle 5	milk_and_milk-based_3 & bakery_and_pastries_1

➡ The **most profitable combinations** are combinations of **snacks with drinks**, which can increase sales through a variety of offers

Profit increase per bundle

Bundle 1
Bundle 2
Bundle 3
Bundle 4
Bundle 5

0   10000   20000   30000   40000   50000

Total profit impact of bundling

3350000
3300000
3250000
3200000
3150000
3100000
3050000
3000000

Profit

+6%

Current Profit   Max Profit After Bundling

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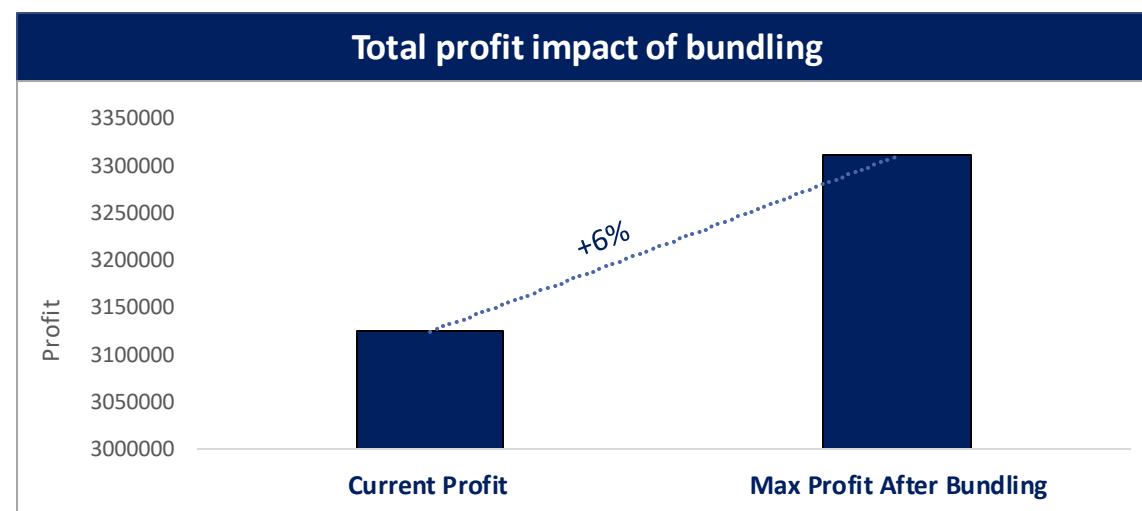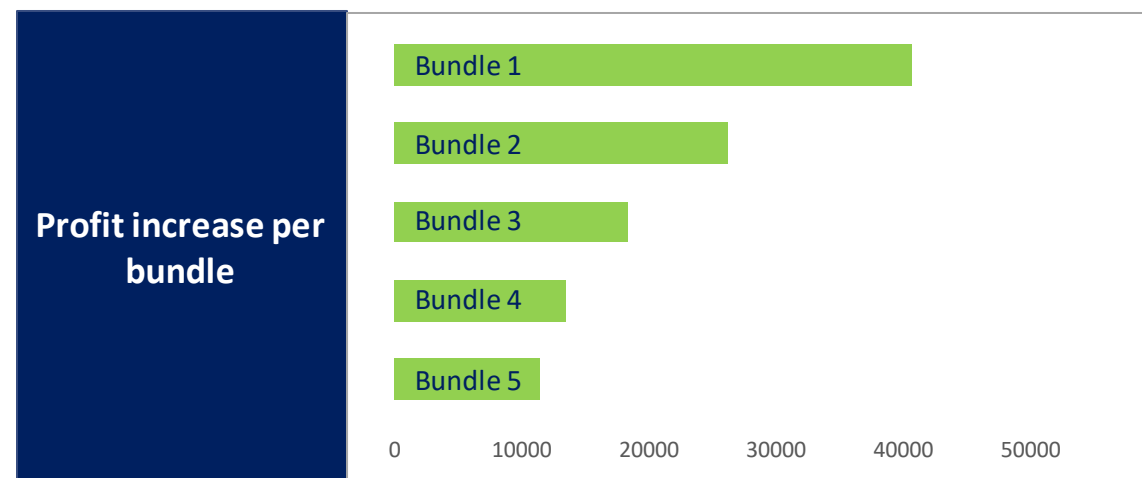
Content

General overview

Optimization levers

Action plan

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By implementing the different optimization levers, the profit is expected to grow by ~16% in the next 5 years, entailing further upside potential

Financial impact

+16.2%

€12,496,464   000%   004%   006%   € 13,621,146   007%   € 14,523,390

Prev Yr   Expansion [1]   Top performers   Bundling   Yr 1   Expansion   Yr 5
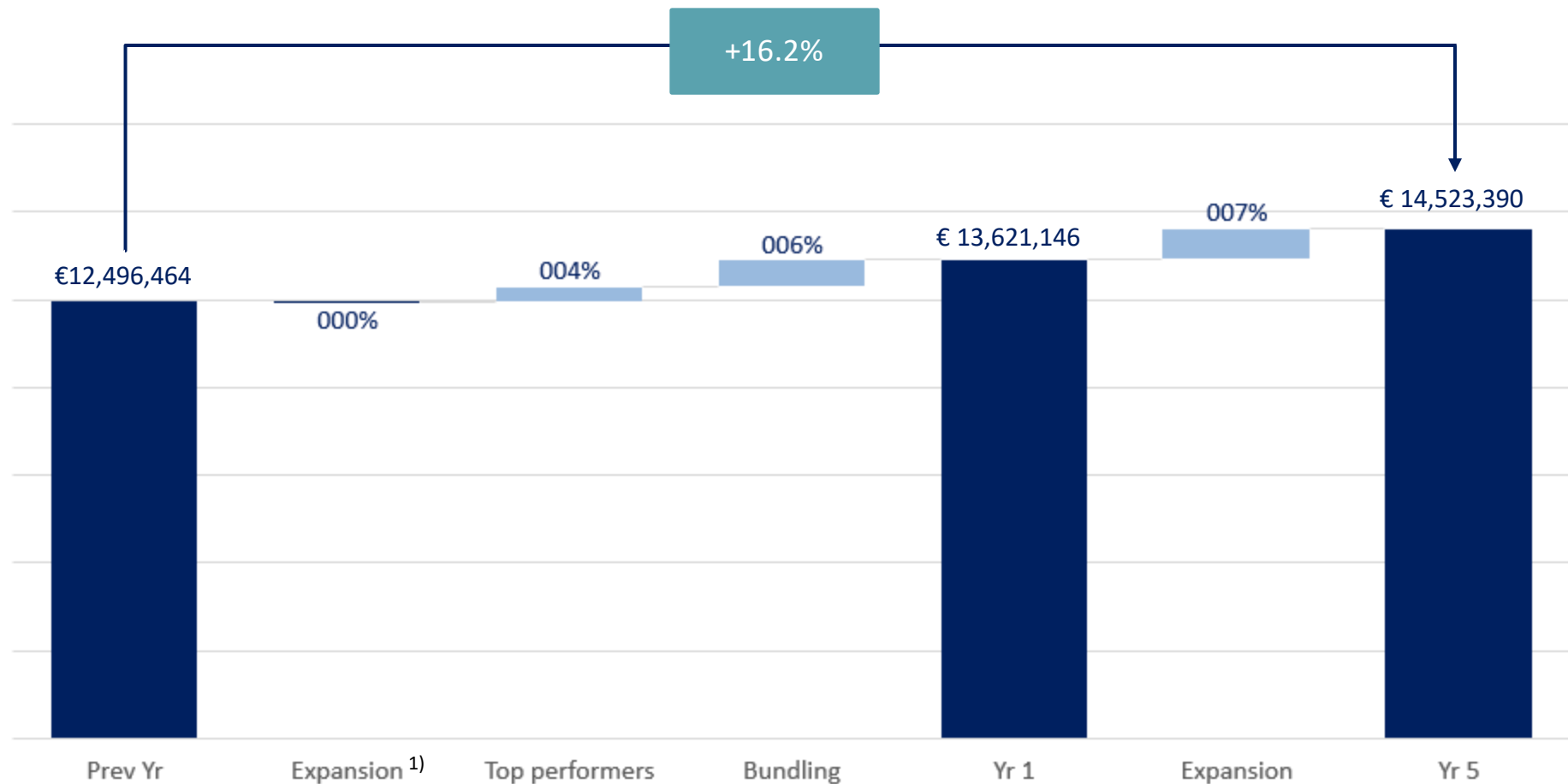
1) In the first year, the effect on profit is negative due to the big initial investment in machines.

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To grow Vendex' business efficiently and sustainably, a 5-stage implementation process is recommended

Project timeline

Replace low-performers with top-performers

Product bundling

Expand to new locations in present cities

Initial expansion to Barcelona

Launch of VendexGO

STAGE 01 **STAGE 02** **STAGE 03** **STAGE 04** **STAGE 05**

Short-term vision
Optimize machine assortment based on the customers most desired products, as well as leverage product bundling based on AI guided price elasticity and demand.

Mid-term vision
Reinvest in current locations and expand according to each region's desirability score. Continue to tune models as Vendex moves to target Barcelona, finalizing preference for the four desirable locations Plaza Catalunya, Grácia, Franca, Sants.

Long-term vision
Redefine the standard of vending machines by launching VendexGO: become a pioneer in digital while boosting performance.
Continue expansion within Spain.

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VendexGo – introducing cashless payments and loyalty programs to enhance customer experience and increase sales

Future outlook

CUSTOMER BENEFITS

Save time
Cashless payments allow customers to conveniently pay with their smartphone or smart watch quickly on the go

Collect points
Customers can collect loyalty points to receive discounts or free products

Special offers
Customers can collect loyalty points to receive discounts and special offers

VendexGO

VENDEX BENEFITS

Generate more immediate sales
Capture impulse purchases, increase spending per consumer, improve pricing flexibility by enabling detailed

Optimize payment costs
Decrease cash management cost and aggregate cashless transactions for lower acquisition cost

Increased knowledge of customer spending behaviour
Easily monitor consumer behaviour and push discounts as well as implement loyalty programs

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BACK UP

Statistical overview location desirability model

Deep Dive: Country expansion

```
> summary(final_model)

Call:
lm(formula = avgdaily_trans ~ small_machine + income_average +
    num_hotels_45 + num_vendex_nearby_300 + indicator + log_transport,
    data = train)

Residuals:
    Min      1Q   Median      3Q      Max
-10.8549  -2.9200  -0.7963   1.8785  25.3103

Coefficients:
                        Estimate Std. Error t value Pr(>|t|)
(Intercept)            5.633e+00  3.053e-01  18.453  < 2e-16 ***
small_machine         -1.819e+00  2.163e-01  -8.411  < 2e-16 ***
income_average         7.395e-07  1.264e-07   5.852 5.77e-09 ***
num_hotels_45          3.008e-01  5.778e-02   5.206 2.15e-07 ***
num_vendex_nearby_300 -1.025e-01  2.941e-02  -3.486 0.000503 ***
indicator              3.369e+00  2.231e-01  15.102  < 2e-16 ***
log_transport          1.625e+00  2.467e-01   6.589 5.81e-11 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 4.411 on 1763 degrees of freedom
Multiple R-squared:  0.2405,    Adjusted R-squared:  0.2379
F-statistic: 93.03 on 6 and 1763 DF,  p-value: < 2.2e-16
```

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External research Barcelona

Barcelona	Sants	França	Grácia	Pl Catalunya
Hotels within 300m	2	3	4	12
Hotels within 1km	21	38	44	130
Transportation routes (number of connections)	10	9	31	50
Additional Data	30M passengers yearly	Every year the number of passengers going down	One of the busiest spots in the city	Most centric and with most connections station
Desirability Location Score	9.6	9.9	11.1	14.1

> Based on the external information gathered for Barcelona, we calculated the location desirability score for a fixed income avg, as it doesn't have much weight in the model, as well as a fixed average number of nearby vendex machines (15). We took the hotels within 300m.

Sources: Booking, Wikipedia, ElPais, Idescat, TMBcat,

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External research Amsterdam

AMSTERDAM	Centraal Station	Zuid Station	RAI Station	Bijlmer ArenA Station
Hotels within 300m	3	1	0	0
Hotels within 1km	31	7	3	4
Transportation routes (number of connections)	51	24	6	43
Additional Data	168,800 daily passengers	41,389 daily passengers	6,273 daily passengers	18,961 daily passengers
Desirability Location Score	11.1	9.9	8.6	10

Based on the external information gathered for Amsterdam, we calculated the location desirability score for a fixed income avg, as it doesn't have much weight in the model, as well as a fixed average number of nearby vendex machines. We took the hotels within 1km.

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Overview final city parameters of Barcelona and Amsterdam

Deep dive: Country expansion

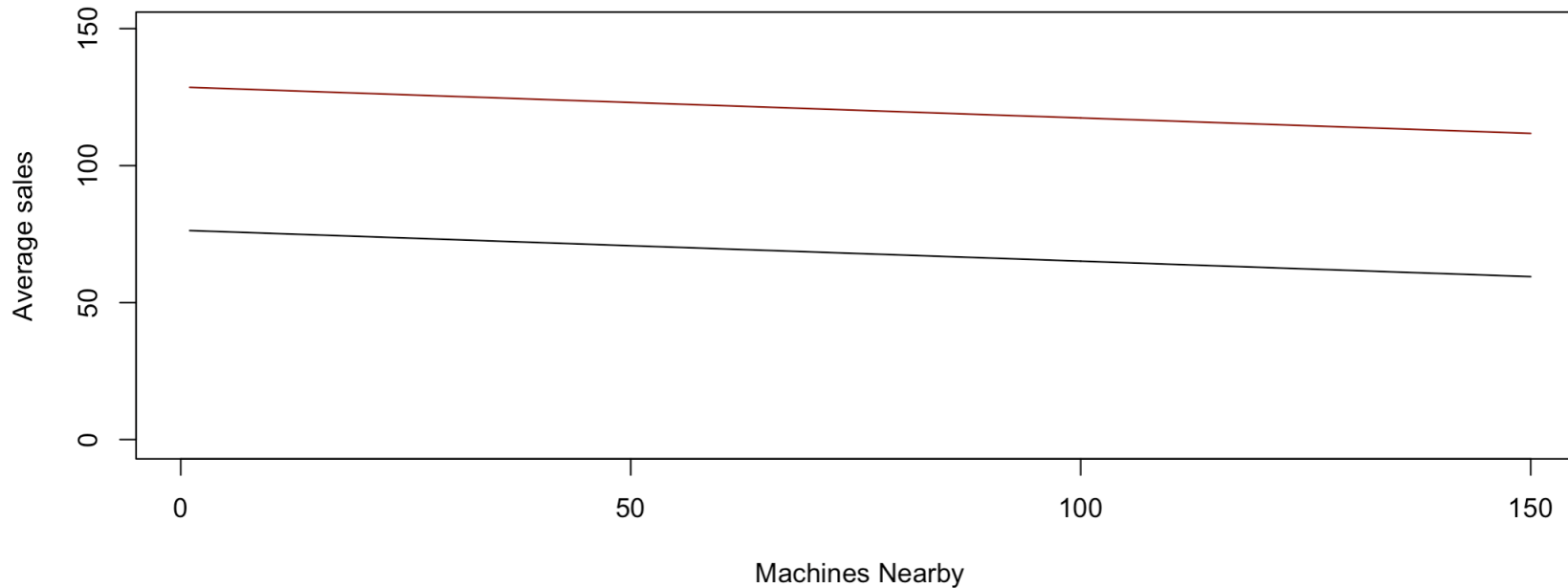|	BARCELONA	AMSTERDAM
Number of 4/5 star Hotels	345	189
Metro Stations	161	58
Bus stops	2606	900
Avg Income	35,000€	49,000€

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Detailed calculations of profitability in each desirable location

Deep dive: Country expansion

	Plaça Catalunya	Gracia	França	Sants
Average margin per transaction	0.64 €	0.64 €	0.64 €	0.64 €
Cost of each new vending machine	3,000.00 €	3,000.00 €	3,000.00 €	3,000.00 €
New Machines	28	22	20	20
Avg Sales per day per machine	12.62	10.3	9	9.04
Total Margin per year	82,544.90 €	52,933.76 €	43,402.88 €	42,234.88 €
Total Fixed Costs	84,000.00 €	66,000.00 €	60,000.00 €	60,000.00 €

Increasing the number of nearby machines favours Barcelona over Amsterdam

Deep dive: Country expansion

Decrease in average sales when increasing the nearby machines:

- **Barcelona: -13%**
- **Amsterdam: -22%**

This reinforces our idea of **expanding to Barcelona**: Increasing the number of nearby machines will reduce our profit less than what it would reduce it in Amsterdam, and therefore our overall profit will be higher.

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Overview top 5 vs bottom 5 bundles

Deep dive: Bundling

Bundle - Top 5	Profit
water_(flavoured)_1 & bakery_and_pastries_1	11437,79
milk_and_milk-based_3 & bakery_and_pastries_2	13585,58
water_(flavoured)_2 & bakery_and_pastries_1	18406,86
milk_and_milk-based_4 & bakery_and_pastries_1	26226,12
milk_and_milk-based_3 & bakery_and_pastries_1	40795,33

Bundle - Bottom 5	Profit
Chocolate_based_4 & milk_and_milk-based_4	-100339,1
Chocolate_based_9 & Chocolate_based_11	-100855,6
Chocolate_based_4 & flavoured_carbonates_4	-109650,7
Chocolate_based_4 & sugar_confectionary_incl_gums_7	-116706,7
Chocolate_based_4 & Chocolate_based_11	-211515,8

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