

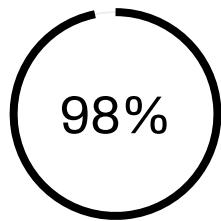


Inventory Management for Product Lines

Competing with Analytics

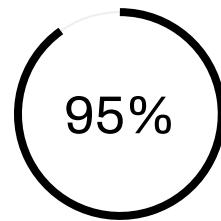
Yiqi Yin, Ali Aamir, Khalisa Bharmal, Myles MacDonald, Amir Parmar
December 7, 2022

Problem



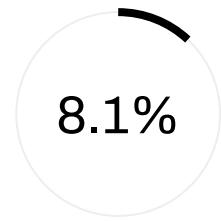
of retailers indicated they expect supply shortages to continue during Q4 of 2022.

Supply Shortage



of retailers indicated they will be unable to fulfill consumers' holiday demand

Seasonality



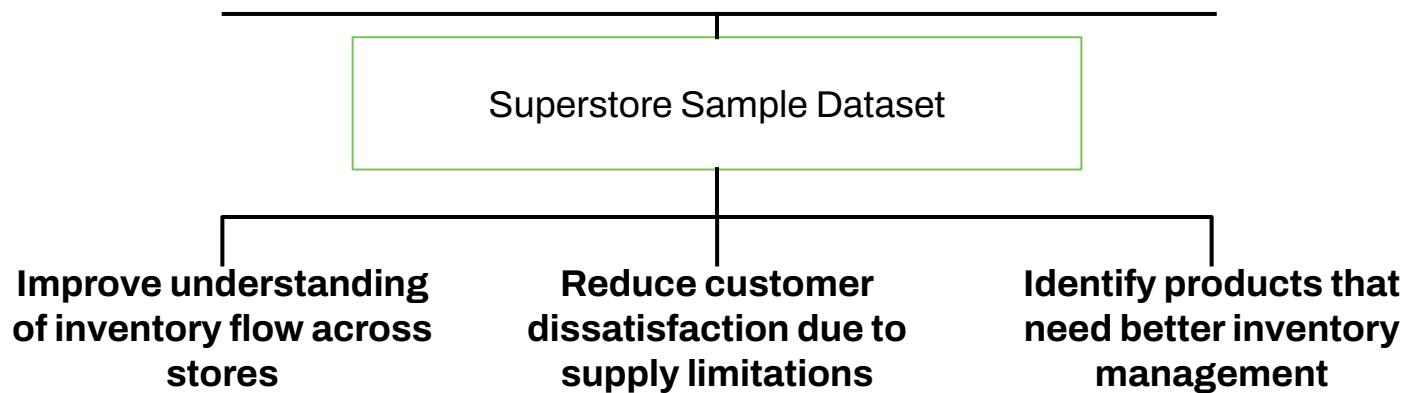
Recorded inflation rate in June 2022 due to supply shortages.

Price Inflation

Source: <https://www.supplychainbrain.com/articles/36148-supply-chain-issues-top-of-mind-for-retailers-this-holiday-season>
<https://www.rateinflation.com/inflation-rate/canada-inflation-rate/>

What Data are we Looking At?

How can the company use an annual sales forecast to better assess stock management?



What Data are we Looking At?

Superstore

Data Code (2) Discussion (1)

13

New Notebook

Download (167 kB)

⋮

Activity Overview

Dataset Stats

Views

3185

Downloads

451

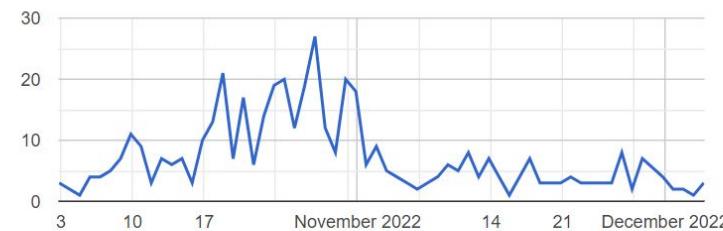
Download per
View Ratio

0.14

Total Unique
Contributors

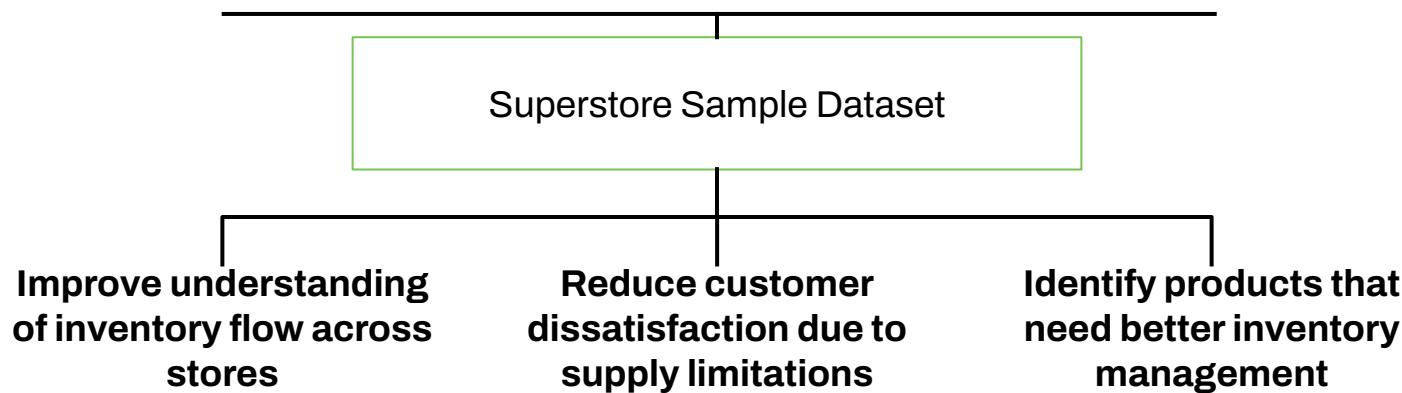
4

Downloads ▾



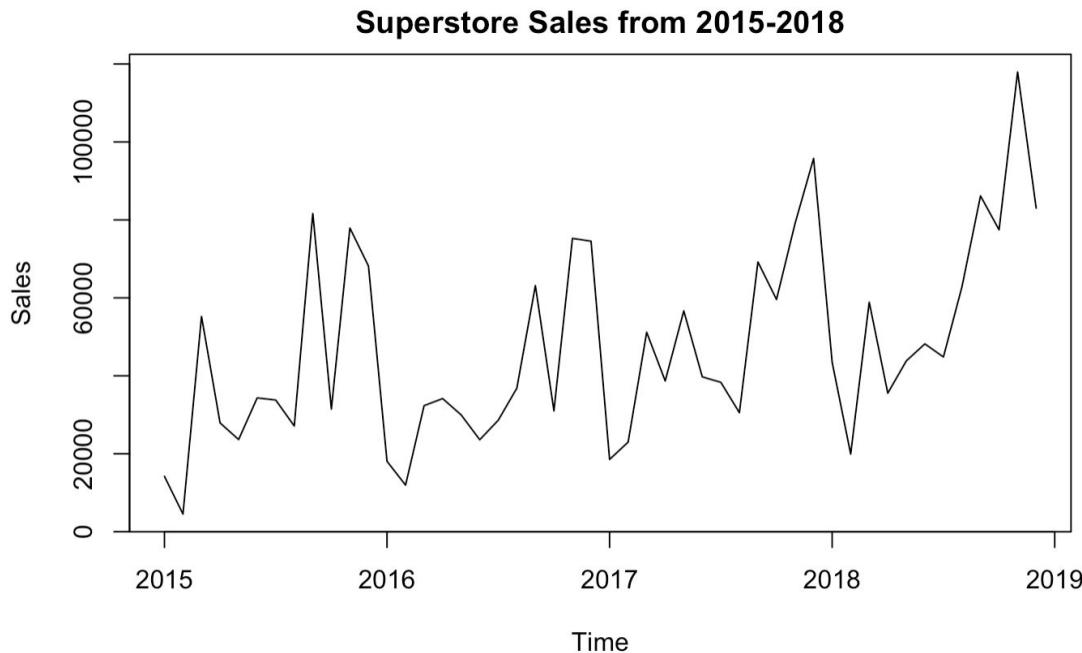
What Data are we Looking At?

How can the company use an annual sales forecast to better assess stock management?



Results

Create Time Series



1

Trend

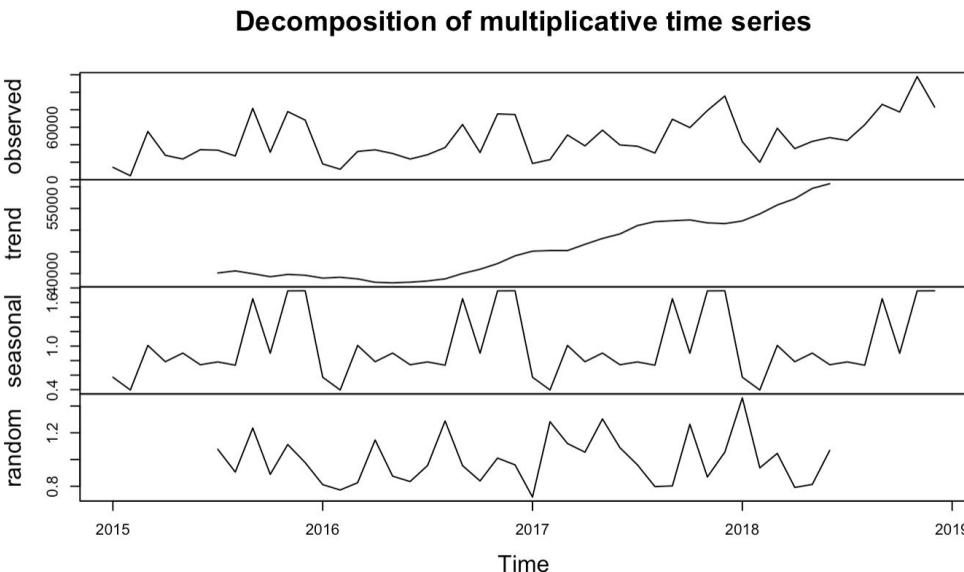
Slight upward trend;
steeper from 2018-2019
(decompose to verify)

2

Seasonality

Appears to be annual
seasonality (decompose
to verify)

Decompose



1

Multiplicative

Magnitude of seasonality increases over time

2

2

Seasonality

Very seasonal, peaking towards end of year

3

Trend

Consistent overall increase in sales over time

Two Year Growth

Month <int>	Two.Year.Sales.Percentage.Increase <dbl>
1	0.3379031
2	0.3727505
3	0.4386291
4	0.5066867
5	0.5742581
6	0.5965151
7	0.2716403
8	0.2793499
9	0.3047683
10	0.3326044
11	0.2983665
12	0.2997955

1

Minimum

July grew 27.1%
between now and two
years ago

2

Maximum

June grew 59.7%
between now and two
years ago

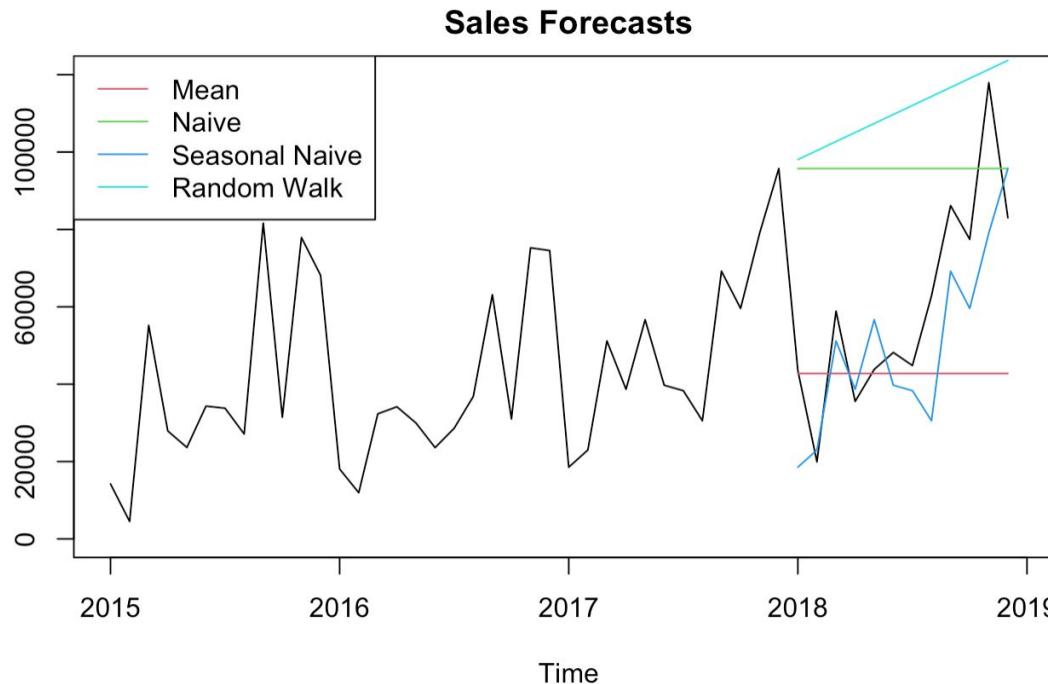
3

Average

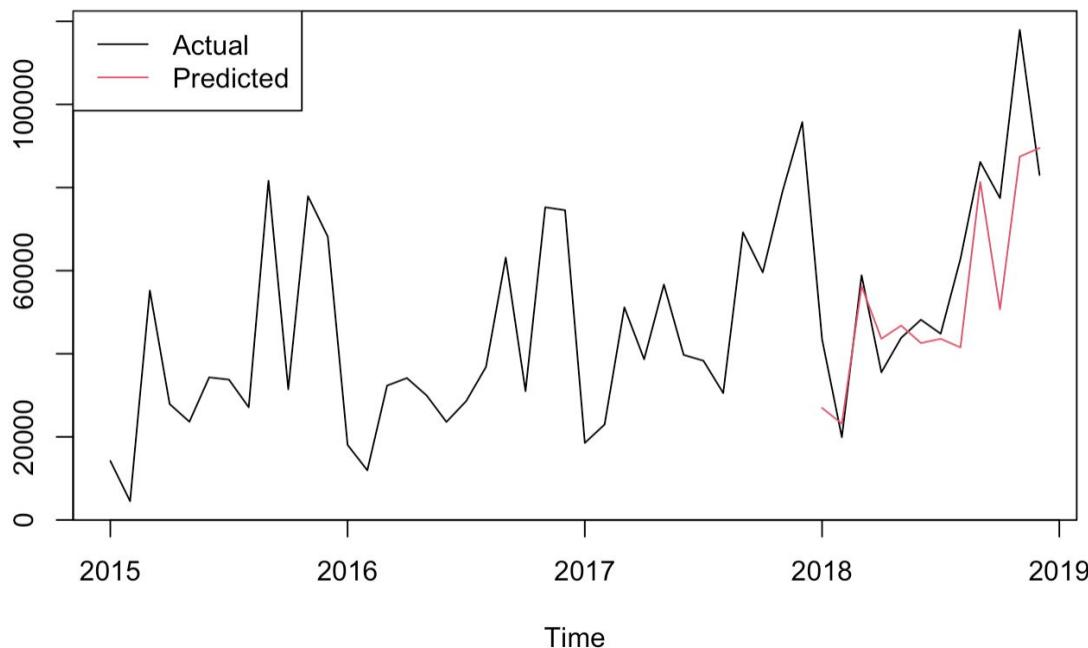
Average growth was
38.4% over the last two
years

Forecasting

Mean, Naive, Seasonal Naive, RWF



Linear Regression



Error Metrics

Forecasting.Method <chr>	Root.Mean.Square.Error <dbl>
mean	31131.16
naive	43945.62
snaive	18932.10
rwf	54422.34
reg	14610.45

1

RMSE

Regression has the least RMSE

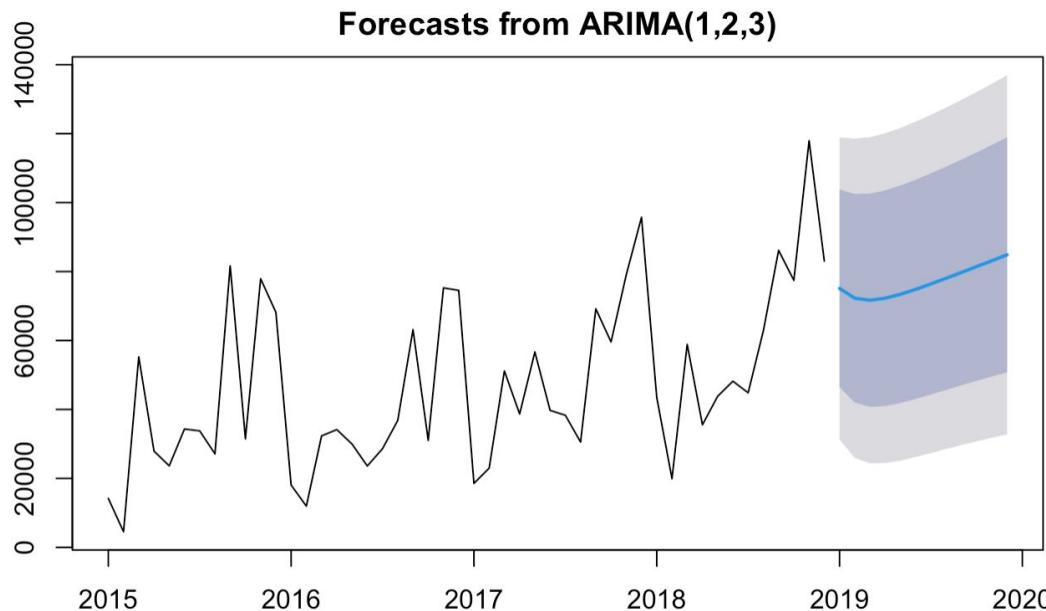
Forecasting.Method <chr>	Mean.Absolute.Percentage.Error <dbl>
mean	0.3513268
naive	0.9872954
snaive	0.2486467
rwf	1.2044755
reg	0.1752178

2

MAPE

Regression has the least RMSE

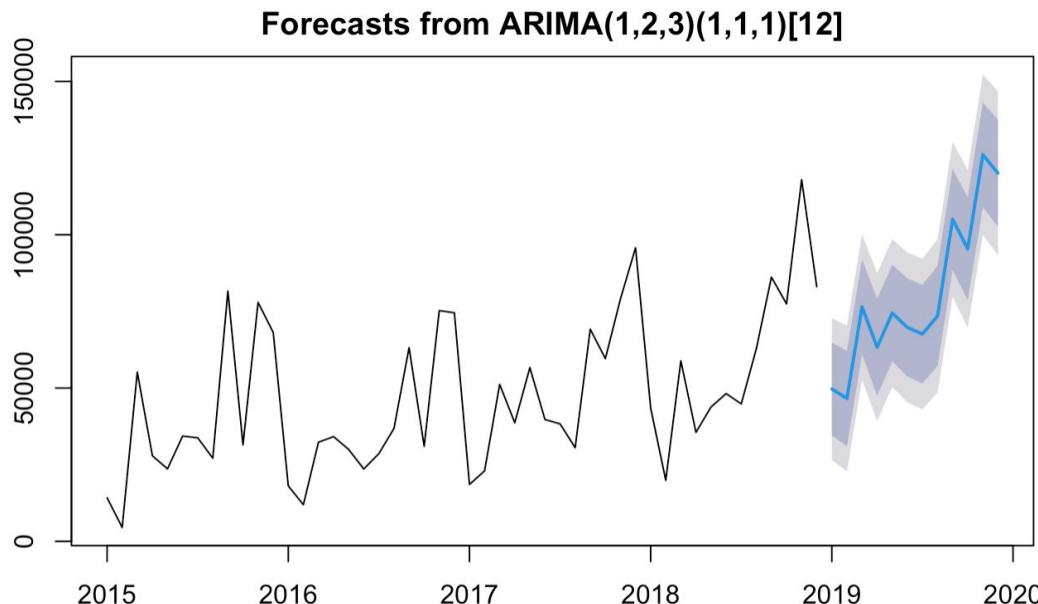
ARIMA



Trend

Slight decrease,
followed by a consistent
increase in 2019

SARIMA



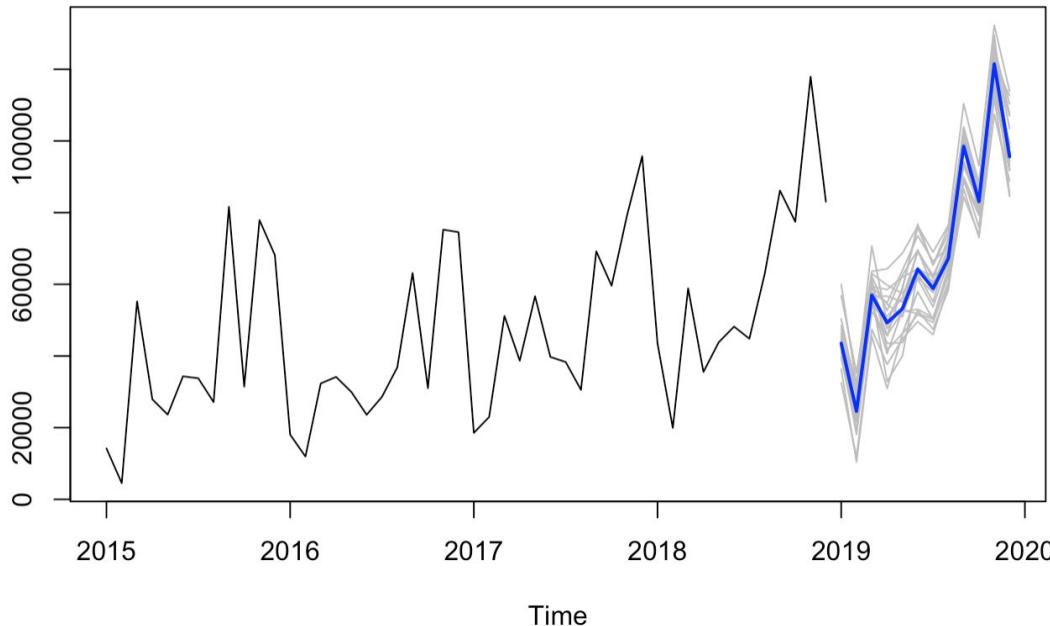
Trend + Seasonality

Introduces seasonality to ARIMA

Lags on trend
Lags on seasonality
12 - monthly data

Feed Forward RNN

Forecasts from ELM



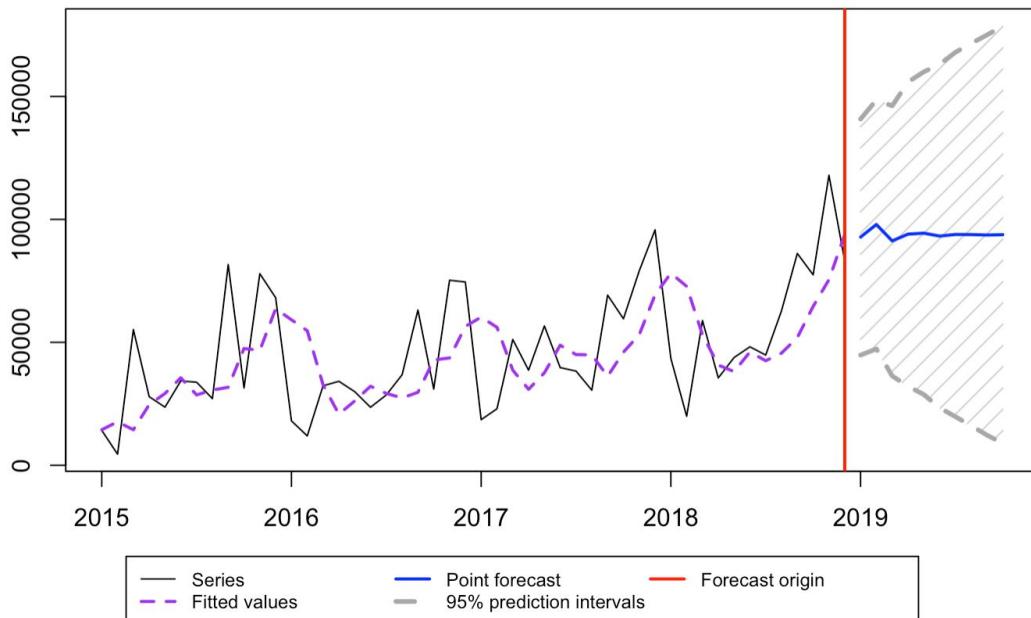
Prediction

No assumption on linearity of trends

New peak between 2019 and 2020

Smoothing

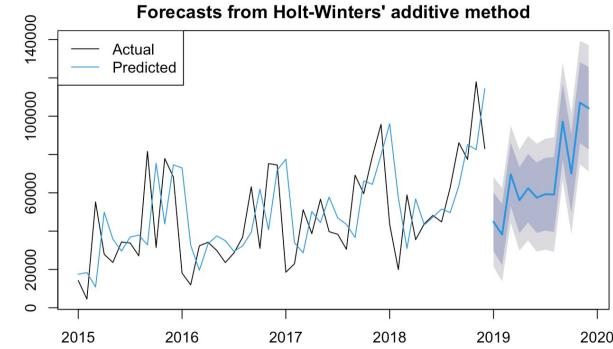
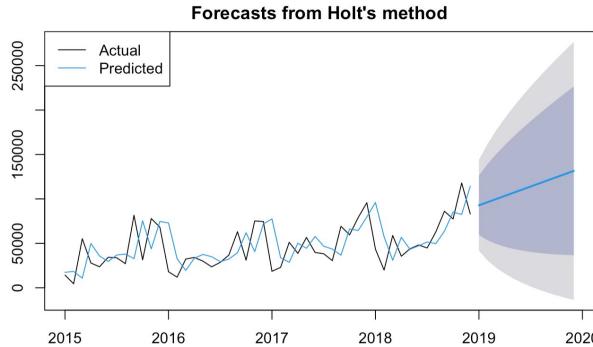
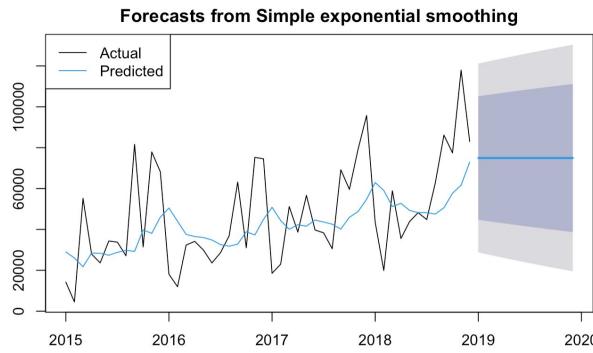
Simple Moving Average



Order

Order 3 was chosen because odd orders produce symmetrical results, and some volatility should be captured

Advanced Smoothing



Trend

Holt's method makes very clear an overall steady increase in demand

Application of Results



Supply Shortage

Improve understanding of demand schedules to match supply, reducing waste and maximizing profit



Seasonality

Better anticipate holiday demand spikes to ensure customer satisfaction



Price Inflation

By addressing supply shortage and anticipating seasonality, help reduce inflation

Next Steps

Specific product lines

Apply models to specific products for detailed analysis

/01

Smoothing parameters

Test and produce least-error alpha, beta, and gamma

/03

Demand shocks

Maximize model resilience to unexpected demand spikes

/02

Trend factors

Further research on industry trends to maximize accuracy

/04

Thank you

Do you have any questions?

Thanks!

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Communication strategy



Mercury

It's the closest planet to the Sun and the smallest in the Solar System



Venus

Venus has a beautiful name and is the second planet from the Sun



Mars

Despite being red, Mars is actually a cold place. It's full of iron oxide dust

“This is a quote, words full of wisdom
that someone important said and
can make the reader get inspired.”

—**Someone Famous**

Project & strategy

You can enter a subtitle here if you need it

/01



Sales and strategy plan

Implementation strategy

Mercury is the closest planet to the Sun

Internal analysis

Venus is the second planet from the Sun

External analysis

Mars is actually a very cold place, not hot

Sales plan implementation

Jupiter is the biggest planet of them all

Sales strategy implementation

Saturn is composed of hydrogen and helium

Project content and strategy

You can give a brief description of the topic you want to talk about here. For example, if you want to talk about Mercury, you can say that it's the smallest planet in the System



Executive summary

Mission

/90%

Mercury is the closest planet to the Sun and the smallest in the System

Vision

Venus has a beautiful name and is the second planet from the Sun

/20%

Objectives

/70%

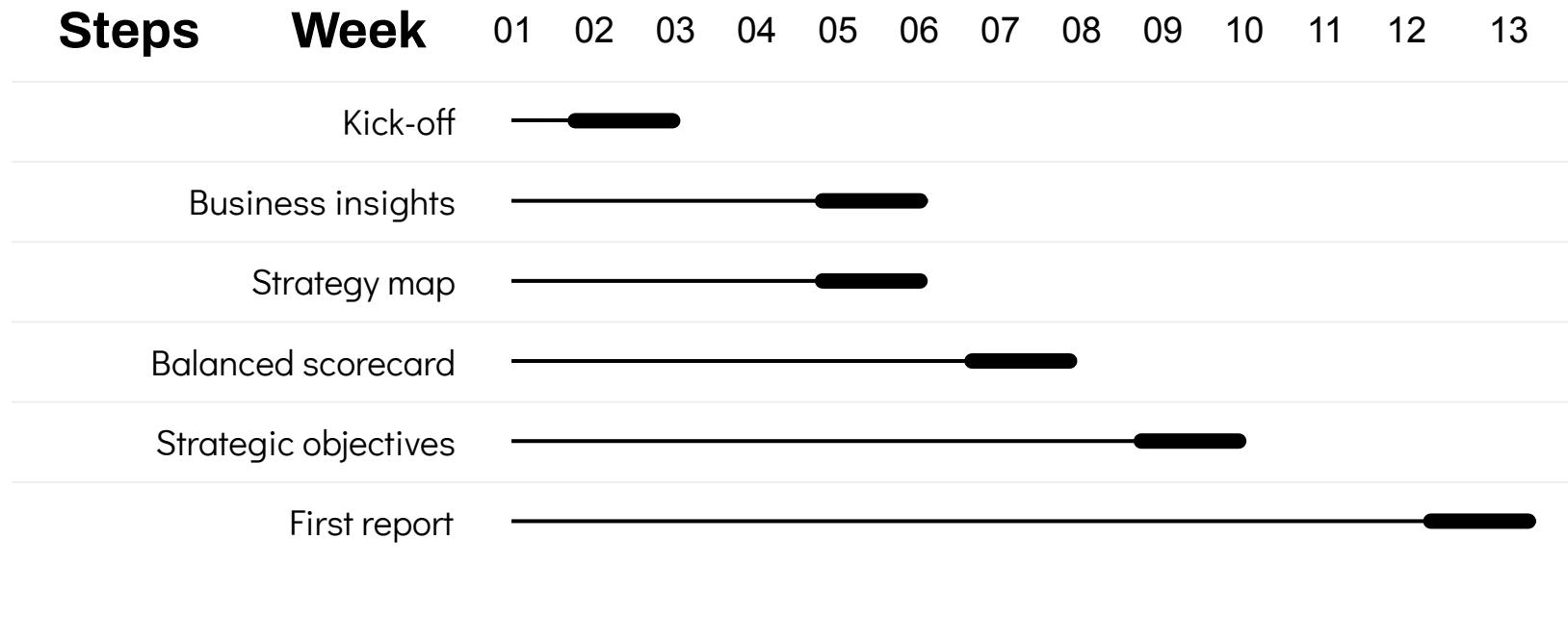
Venus has a beautiful name and is the second planet from the Sun

Key initiatives

Despite being red, Mars is a very cold planet full of iron oxide dust

/50%

Strategic planning project plan



Strategic map and balanced scorecard

Perspectives

Financial

F.1. Insert your own text

Strategic objectives

F.2. Insert your own text

F.3. Insert your own text

Customer

C.1. Insert your own text

C.2. Insert your own text

C.3. Insert your own text

Internal process

I.1. Insert your own text

I.2. Insert your own text

I.3. Insert your own text

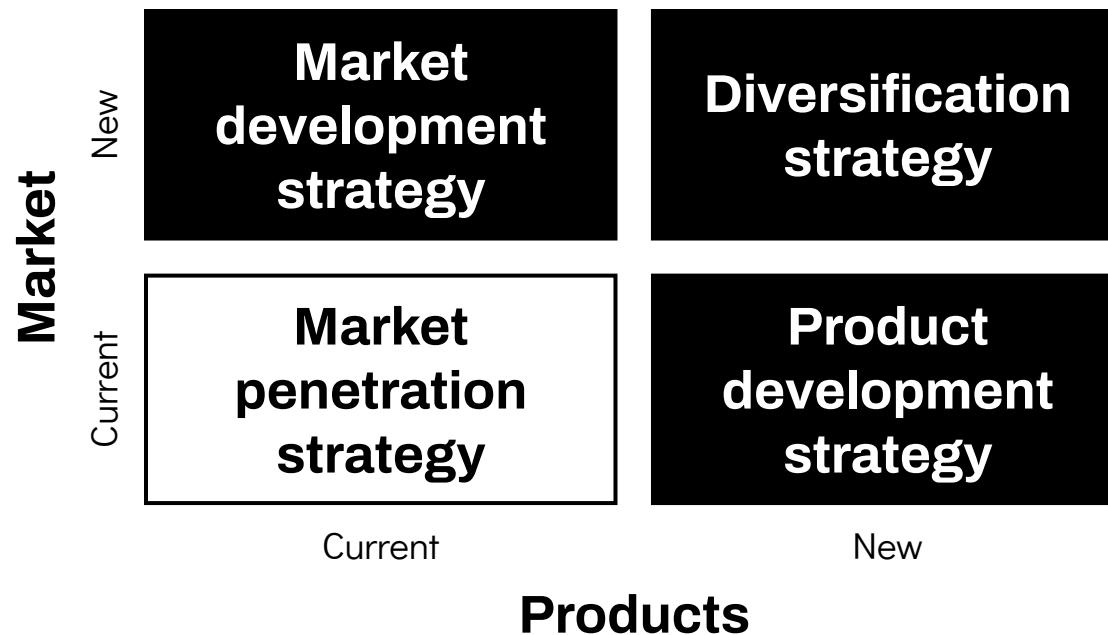
Learning & growth

L.G.1. Insert your own text

L.G.2. Insert your own text

L.G.3. Insert your own text

Products, prices & distribution channels



■ Use a different color for the strategic option you recommend the company

Impact of the risk

/29%

Mercury

Mercury is the closest planet to the Sun

/23%

Mars

Mars is a cold place.
It's full of iron oxide dust



/10%

Venus

Venus is the second planet from the Sun

/38%

Saturn

It was named after the Roman god of wealth

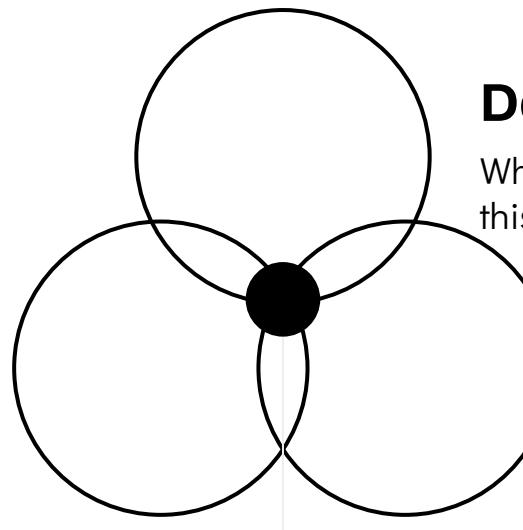
Key stakeholder groups

	Description	Example
The situation	- Insert your description here	- Insert your description here
The complication	- Insert your description here	- Insert your description here
The question	- Insert your description here	- Insert your description here

New market, new product, new company

Profitability

What is the potential demand
for our product market?

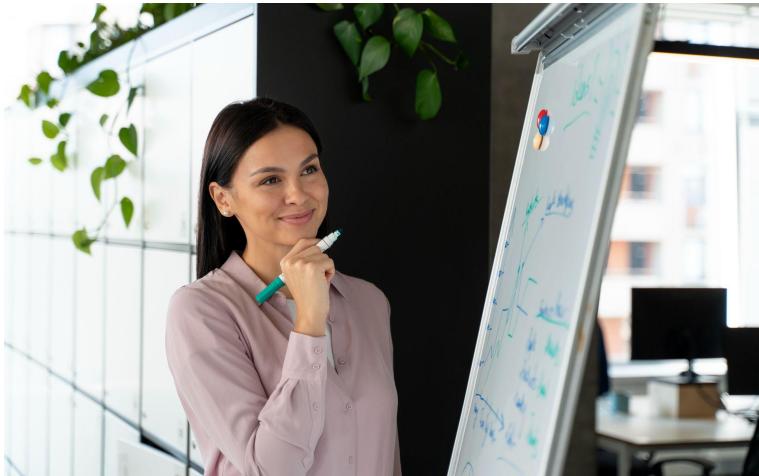


Desirability

What will be the profitability of
this strategic initiative?

Feasibility

What is the feasibility to enter
in this new market?



Consulting proposal

/02

You can enter a subtitle here if you need it



A picture always reinforces the concept

Images reveal large amounts of data, so remember: use an image instead of a long text. Your audience will appreciate it



**A picture is worth a
thousand words**

Communication objectives

Mercury

It's the third planet from the Sun and the only one that harbors life in the Solar System. This is where we live



Mars

Despite being red, Mars is actually a cold place. It's full of iron oxide dust, which gives the planet its reddish cast

Venus

Venus is the second planet from the Sun. It has extremely high temperatures and a toxic atmosphere



Jupiter

Jupiter is a gas giant and the biggest planet in the Solar System. It's the fourth-brightest object in the night sky

Awesome words



Strong marketing plan

Political

Mercury is the closest planet to the Sun and the smallest

P

Economical

Venus is terribly hot and its atmosphere is poisonous

E

Social

Mars actually is a cold place. It's full of iron oxide dust

S

T

Technological

Earth is the beautiful planet where we all live

L

Legal

Saturn is composed mostly of hydrogen and helium

E

Environmental

Neptune the fourth largest object by diameter

Strong marketing case

Project cost:

\$435,000

Tangible benefits:

\$14,000

Net present value:

\$8,000

\$400,000

Change impact

Low

Medium

High

Intangible benefits

Strategic alignment

Resources

Insert your own text here

Insert your own text here

Insert your own text here

Sponsor name

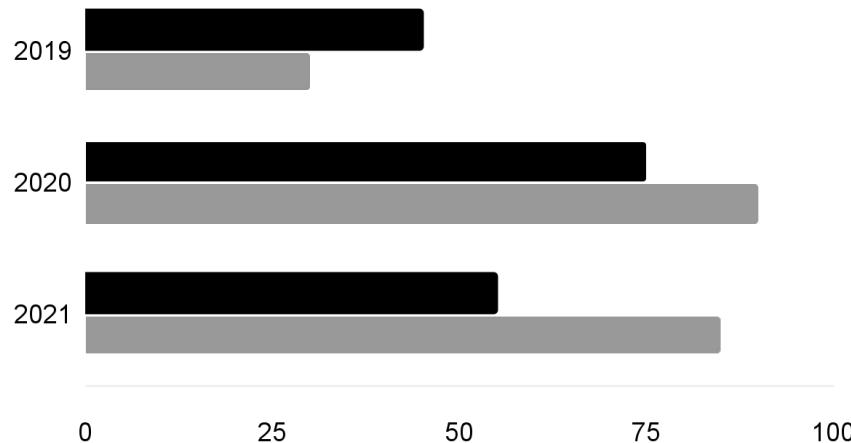
Manager name

Mars is actually very cold



Financial model

Financial model



Ceres



Ceres is located in the main asteroid belt

Earth



Is the only planet that harbors life

Follow the link in the graph to modify its data and then paste the new one here. [For more info, click here](#)

Pricing strategy

	Basic	Standard	Advanced	Leading
Level	1	2	3	4
Percentage	20%	70%	10%	<1%
Description	- Insert your description here - Insert your description here			

Consulting proposal

Mercury

/01 Mercury is the closest planet to the Sun

Venus

/02 Venus is the second planet from the Sun

Mars

/03 Despite being red, Mars is a cold place

Jupiter

/04 Jupiter is the biggest planet of them all

Saturn

/05 Saturn is composed of hydrogen and helium

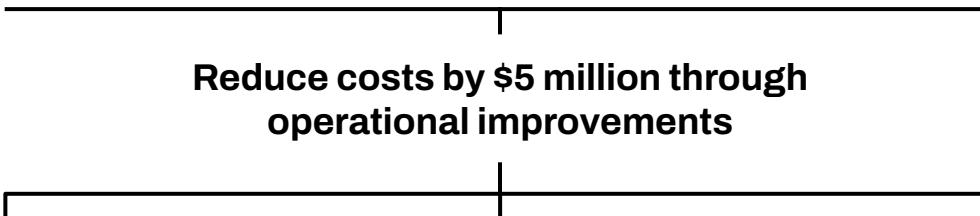
Neptune

/06 Neptune is the farthest planet from the Sun

Answer and supporting arguments

How can the company reduce its cost by 10%?

Reduce costs by \$5 million through
operational improvements



Outsource non-core functions to save \$3M

Mercury is the closest
planet to the Sun and the
smallest of them all

Simplify core functions processes to save \$1M

Venus has a beautiful
name and is the second
planet from the Sun

Review supplier cost to save \$100M

Despite being red, Mars is
actually a cold place. It's
full of iron oxide dust

Waterfall management plan

Requirements

Venus has a beautiful name and is the second planet from the Sun

Design

Jupiter is a gas giant and the biggest planet of them all

Implementation

Mars is full of iron oxide dust, which gives the planet its color

Verification

Saturn is composed mostly of hydrogen and helium

Maintenance

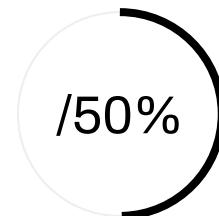
Saturn is a gas giant and the only planet with rings

Maturity model



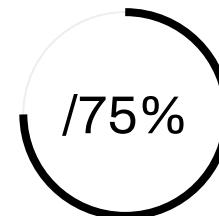
Mercury is the closest planet to the Sun and the smallest in the Solar System

Basic



Venus has a beautiful name and is the second planet from the Sun

Standard



Despite being red, Mars is actually a cold place. It's full of iron oxide dust

Advanced



Impact & effort



Impact

Mercury is the closest planet to the Sun and the smallest one in the Solar System
it's only a bit larger than the Moon

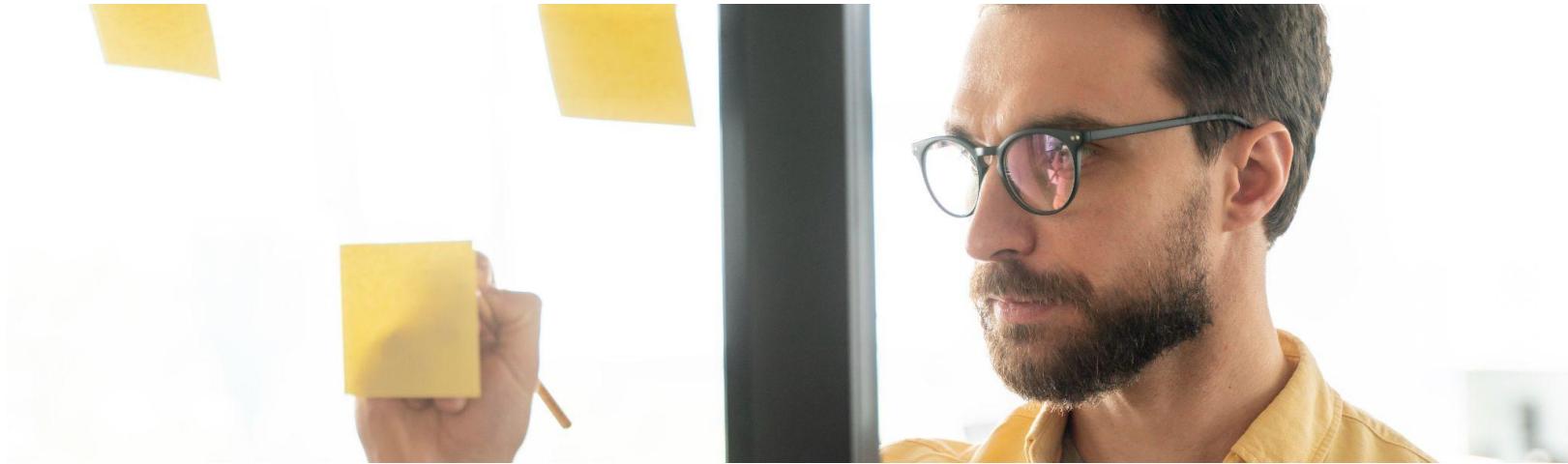


Effort

Venus has a beautiful name and is the second planet from the Sun. It's hot and has a poisonous atmosphere

Stakeholder matrix

Your question	Impact			Effort
/01 You can write your answer here	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Very high
/02 You can write your answer here	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	High
/03 You can write your answer here	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Low
/04 You can write your answer here	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	High
/05 You can write your answer here	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Very high



/03

Implementing changes

You can enter a subtitle here if you need it



Ansoff growth matrix

Do you know what helps you make your point clear? Lists like this one:

- They're simple
- You can organize your ideas clearly
- You'll never forget to buy milk!

And the most important thing: the audience won't miss the point of your presentation

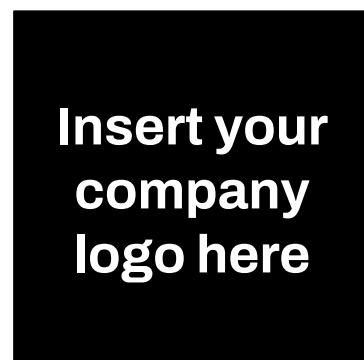
Business case

Business name

01/ Mercury is the
smallest planet

02/ Venus is an
extremely hot planet

03/ Earth is the planet
where we all live



04/ Mars is actually a
very cold place

05/ Jupiter is the
biggest planet

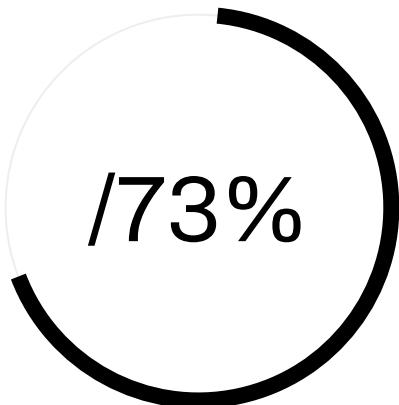
06/ Saturn is the only
planet with rings

xx/xx/xx

Competitor analysis

Attributes	Competitor A	Competitor B	My business
Price	\$50,800	\$30,200	\$70,500
Quality	Low	Medium	High
Customer age	20-40	18-45	18-50
Reputation			
Location	Spain	Italy	US

Target



- Mercury is the smallest planet of them all
- Venus has extremely high temperatures

Venus

Venus has a beautiful name and is the second planet from the Sun. It's terribly hot, even hotter than Mercury

Thomas Wells

Xx years old
Experience
Occupation

Implement, track and manage progress

Progress	Status	Link
Mercury	<div><div style="width: 40%;">40%</div></div> 	www.yourlinkhere.com
Venus	<div><div style="width: 30%;">30%</div></div> 	www.yourlinkhere.com
Mars	<div><div style="width: 70%;">70%</div></div> 	www.yourlinkhere.com
Jupiter	<div><div style="width: 25%;">25%</div></div> 	www.yourlinkhere.com
Saturn	<div><div style="width: 85%;">85%</div></div> 	www.yourlinkhere.com

Change management strategy and plan

Size of the change				
Extreme	Name of the change here	Name of the change here	Name of the change here	
High			Name of the change here	Name of the change here
Medium				Name of the change here
Regular				
Low				
	Team impacted	Business unit	Division	Half company
				Extreme

/04

Change management

You can enter a subtitle here if you need it



/\$150,000

Big numbers catch your audience's attention

About the terms of the agreement



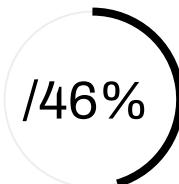
/25%

Venus

Venus has a beautiful name and is the second planet from the Sun. It's terribly hot, even hotter than Mercury, and its atmosphere is extremely poisonous

Mars

Mercury is the smallest planet in the System. This planet's name has nothing to do with the liquid metal, since Mercury was named after the Roman messenger god



/46%



/40%

Jupiter

Jupiter is a gas giant and the biggest planet in the Solar System. It's the fourth brightest object in the night sky. It was named after the Roman god of the skies

/65%

Jupiter is the biggest planet of them all

/\$333,000

Despite being red, Mars is a cold place

/\$489,000

Saturn is the only planet with rings

Management approach



/01

/02

/03

/04

Mercury

It's the smallest planet of them all

Venus

It has extremely high temperatures

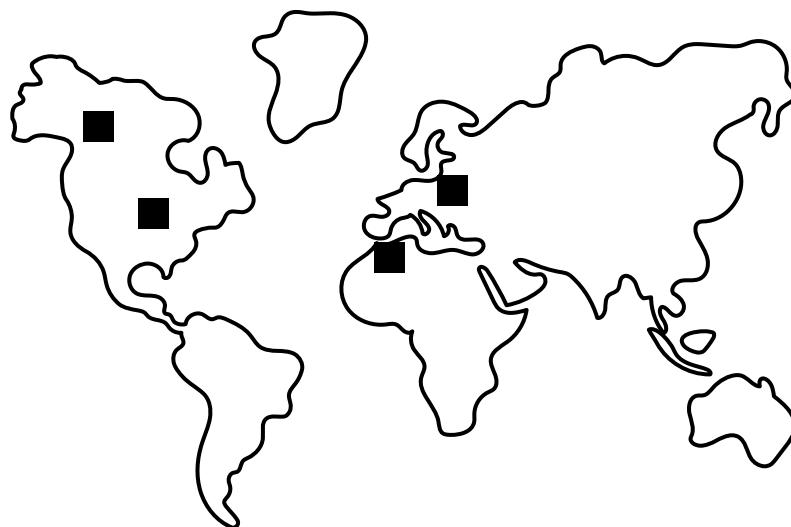
Mars

Despite being red, Mars is very cold

Jupiter

It's the biggest planet of them all

Strategic alliances



Venus

Venus has a beautiful name and is the second planet from the Sun. It's hot and has a poisonous atmosphere

Answer and arguments

Your question

You can write your answer here

Mercury

It's the closest planet to the Sun and the smallest in the Solar System

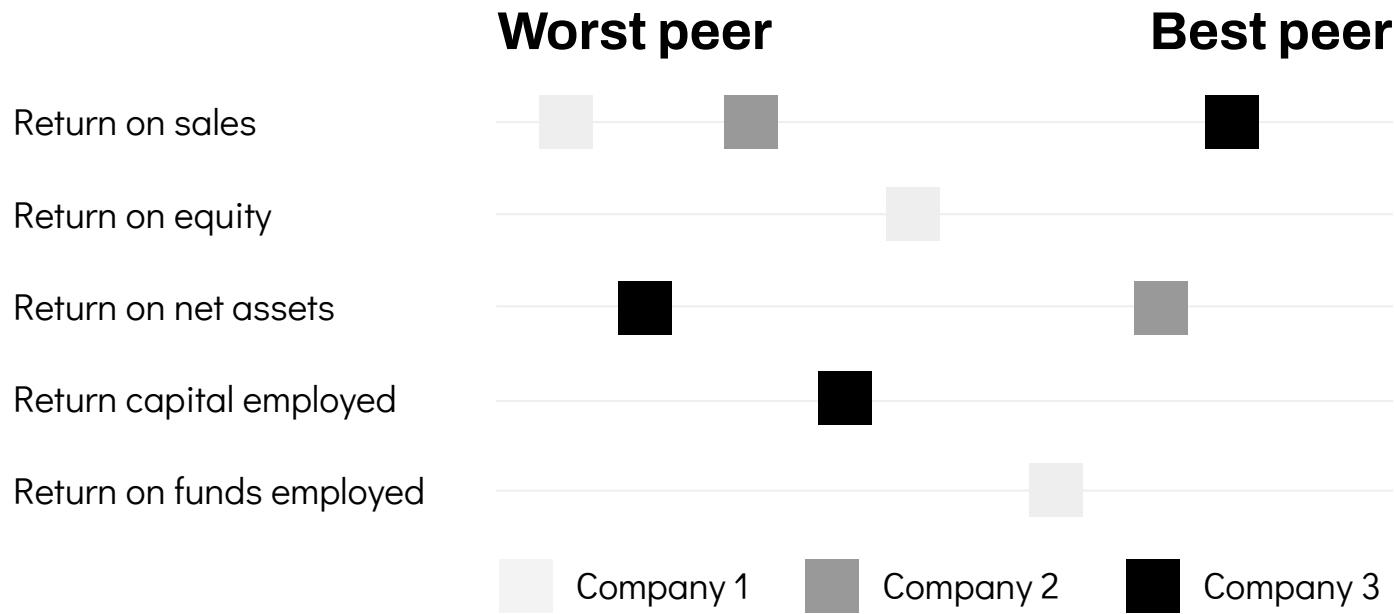
Venus

Venus has a beautiful name and is the second planet from the Sun

Mars

Despite being red, Mars is actually a cold place. It's full of iron oxide dust

Profitability ratios



Top 10 questions of business plans

What is your situation? /01

What is your vision? /02

How to reach your vision? /03

What do you offer? /04

How big is the market? /05

/06 Who are the key players?

/07 How to make a difference?

/08 What is your marketing plan?

/09 What are your economics?

/10 What do you need to start?

Tablet app

You can replace the image on the screen with your own work. Just right-click on it and select “Replace image”



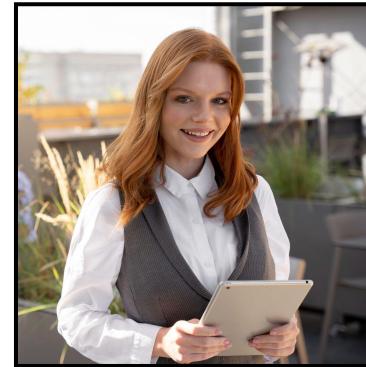
Our team

**Jenna Doe**

You can speak a bit about
this person here

**Timmy Jimmy**

You can speak a bit about
this person here

**Susan Bones**

You can speak a bit about
this person here

Alternative resources

Here's an assortment of alternative resources whose style fits the one of this template

Photos

- Businesspeople meeting at office working
- Businesspeople at office meeting
- Businesspeople at office meeting hand shake
- Business people shaking hands
- People working as a team company
- Coworkers having a work meeting
- Medium shot woman leading meeting indoors
- Business people working in a company
- Close up business people in conference room
- Colleagues working together on project
- Group of coworkers putting their hands together
- Close up on company employee smiling

Resources

Did you like the resources on this template? Get them for free at our other websites:

Photos

- Businesspeople meeting at office working
- Close up on company team working
- From above women at laptop
- People working as a team company
- People working as a team company
- People working as a team company
- Person working as part of company team
- People working as a team company
- Close up on company team working
- Person posing next to coworkers
- Close up on company employee smiling
- Close up on company employee smiling

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(<https://fonts.google.com/specimen/Archivo>)

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#000000



#ffffff



#999999



#eeeeee

Storyset

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Pana



Amico



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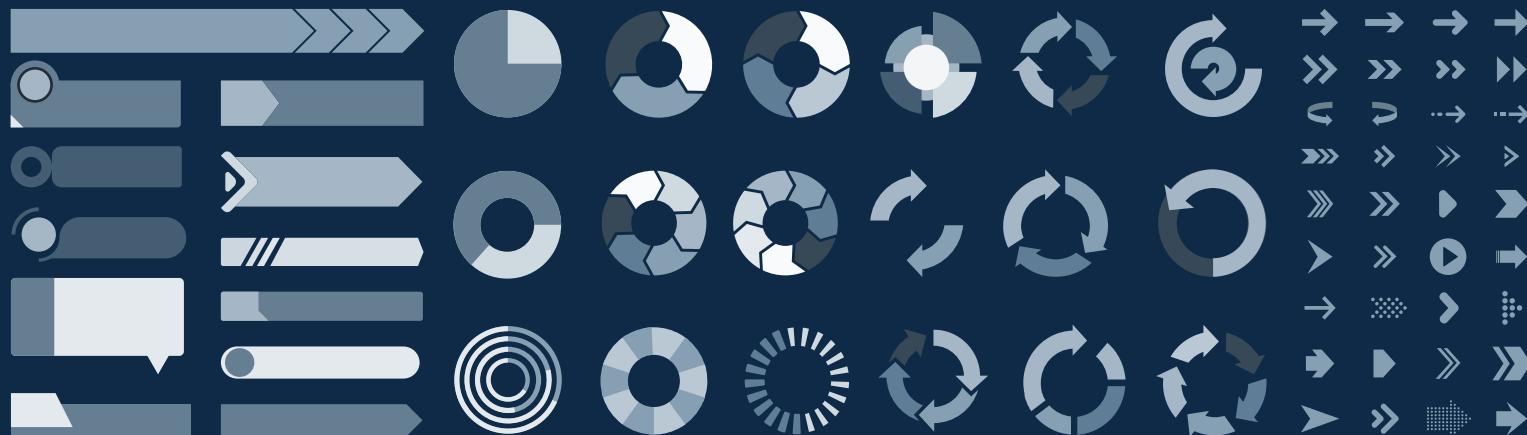
Rafiki



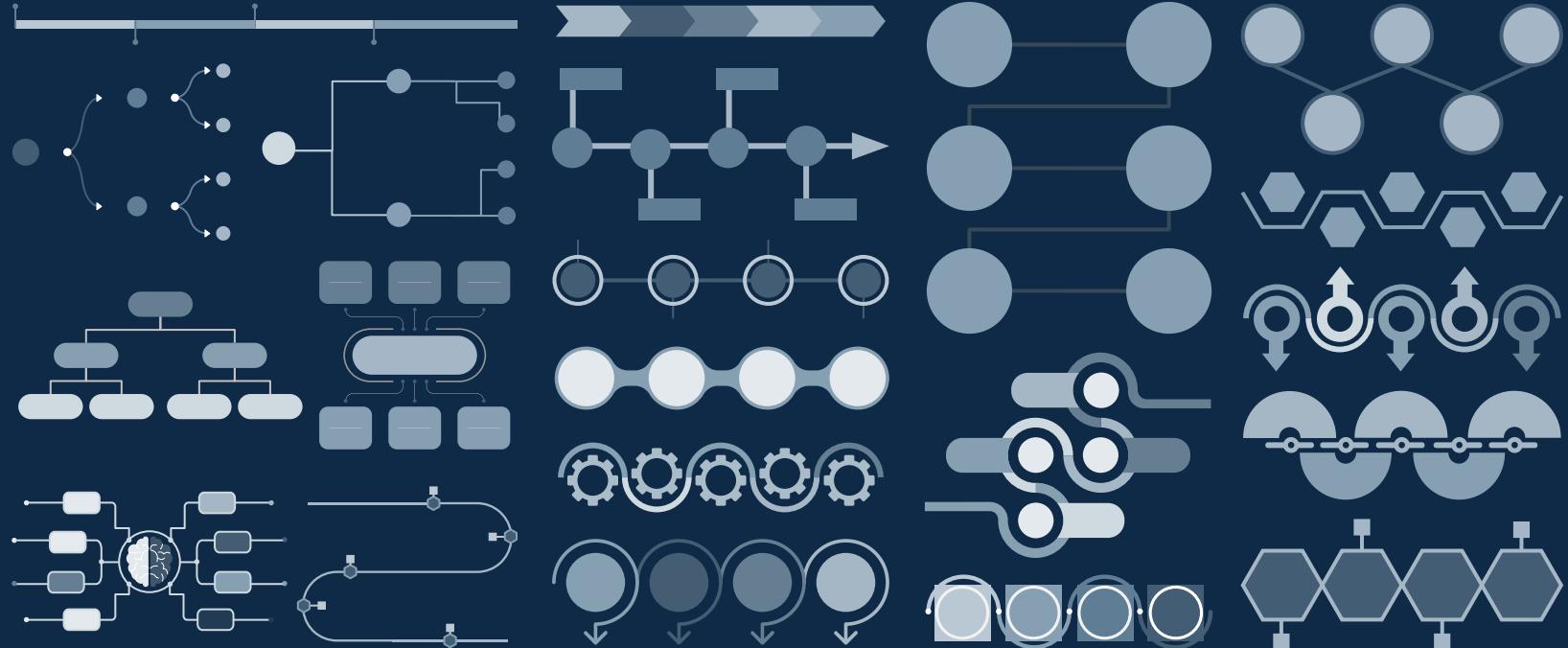
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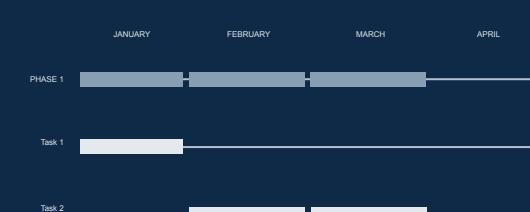
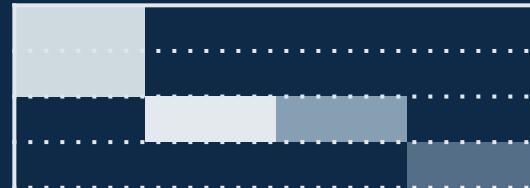
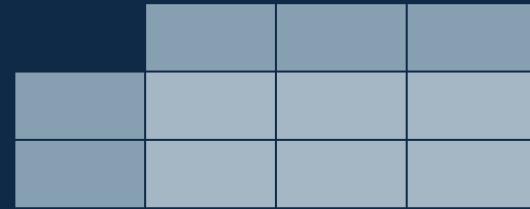
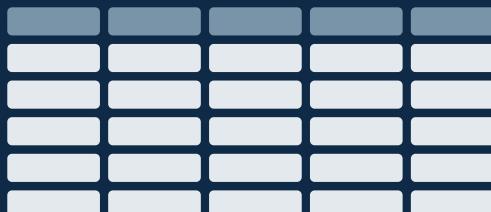
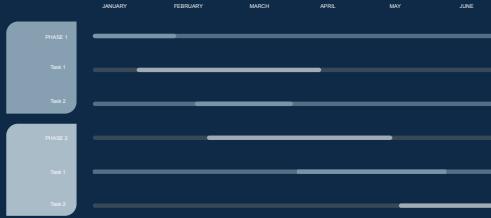
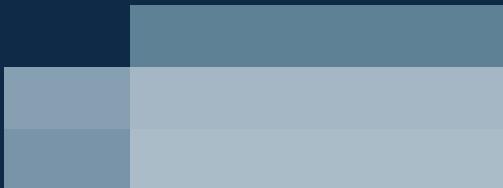
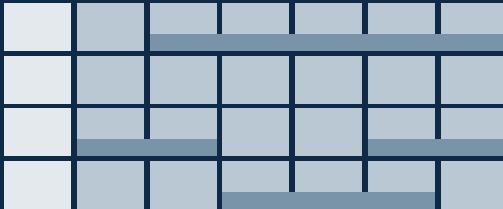
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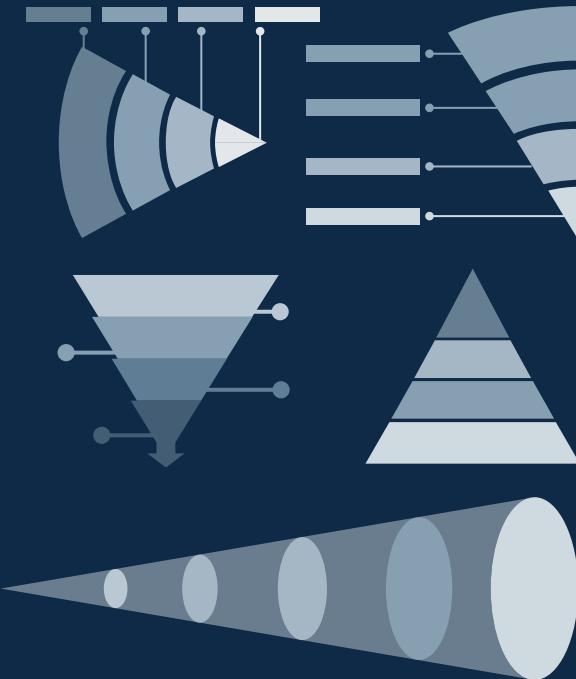
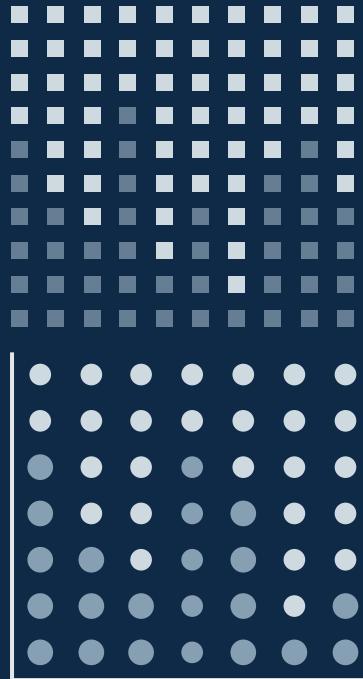












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