



MBD | Analytics for Retail & Consumer

# Supply-chain system optimization leveraging demand forecasting

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Tuesday, June 4<sup>th</sup> 2019

Today, we will demonstrate how AFR can leverage on demand forecasting to improve its operational efficiency and boost the company's profitability



## Background

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Company overview

Project expectations



## Situational Analysis

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Supply-chain

Pain points

KPIs



## Solution space

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Methodology

Benefits

Further improvements



## Proposal

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# AFR active in kids fashion market with production facilities in CN, TR & PT – increasing competition leading to significant price pressure

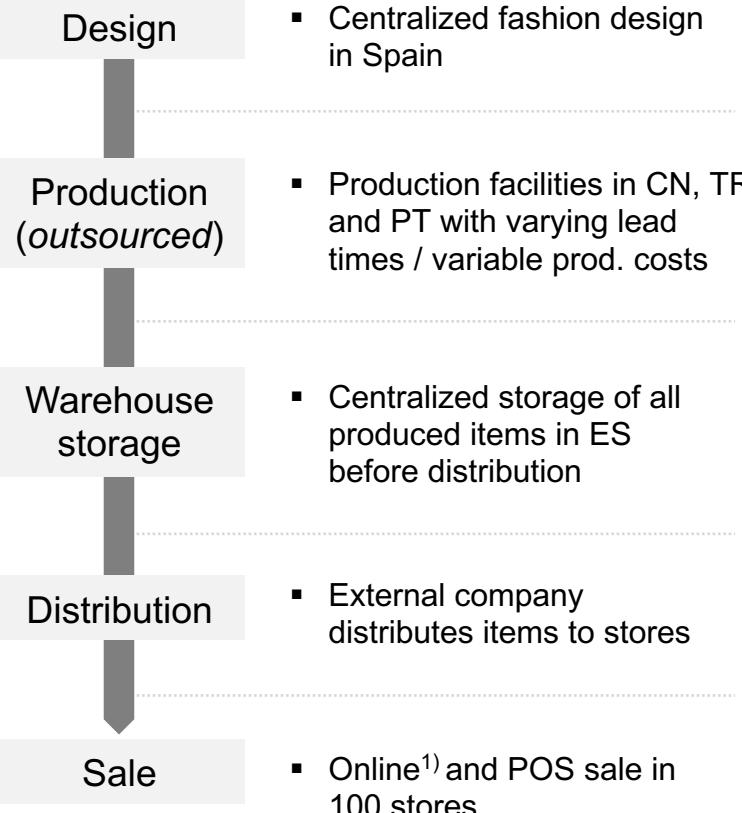
## Background

### AFR Client snapshot

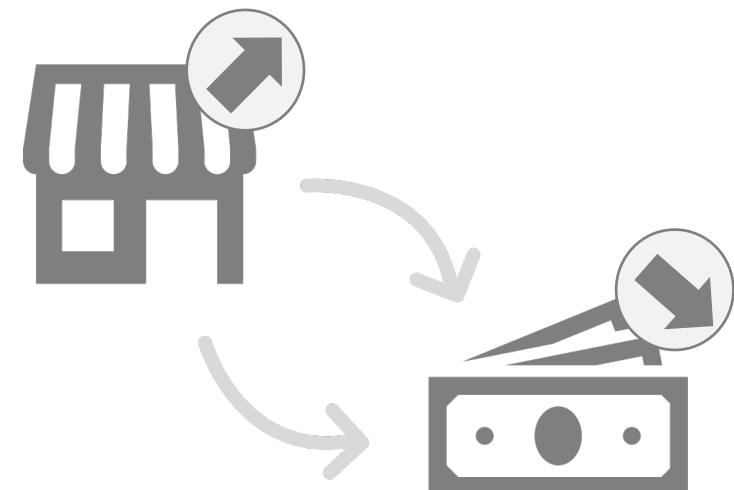


- Portfolio of **>1000 different products** per season – wide selection of products to specifically meet demands of each addressed age group
- **100 stores** in Spain (ca. 70% of sales), multi-brand stores and online (ca. 30%)<sup>1)</sup>
- Historically **high-margin** business **currently bruised** – sales stable

### Operations overview



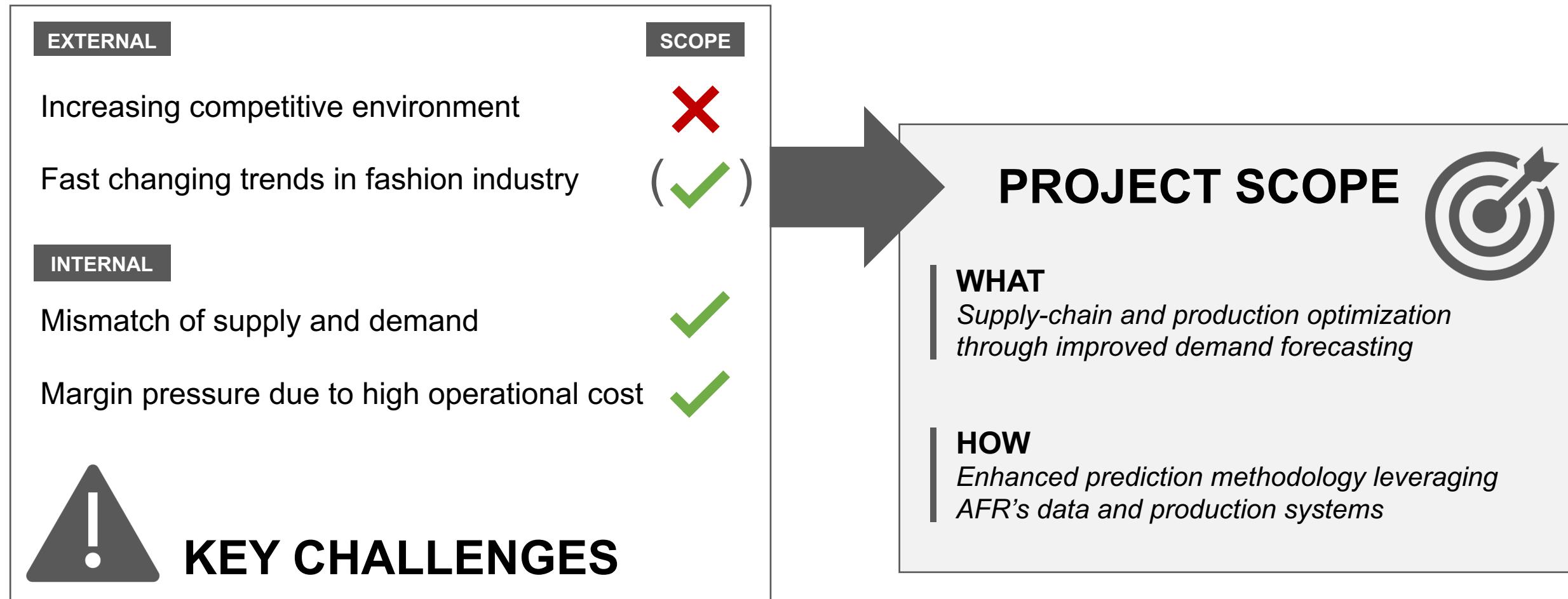
### Environment



- **Increasing competition** imitating AFR's strategy and product – mostly at lower prices
- With sales down, AFR was forced to reduce prices, **resulting in significantly lower margins** – sales stabilized

# AFR's operational inefficiencies and margin pressure require quick and decisive counteraction with regard to improved demand forecasting

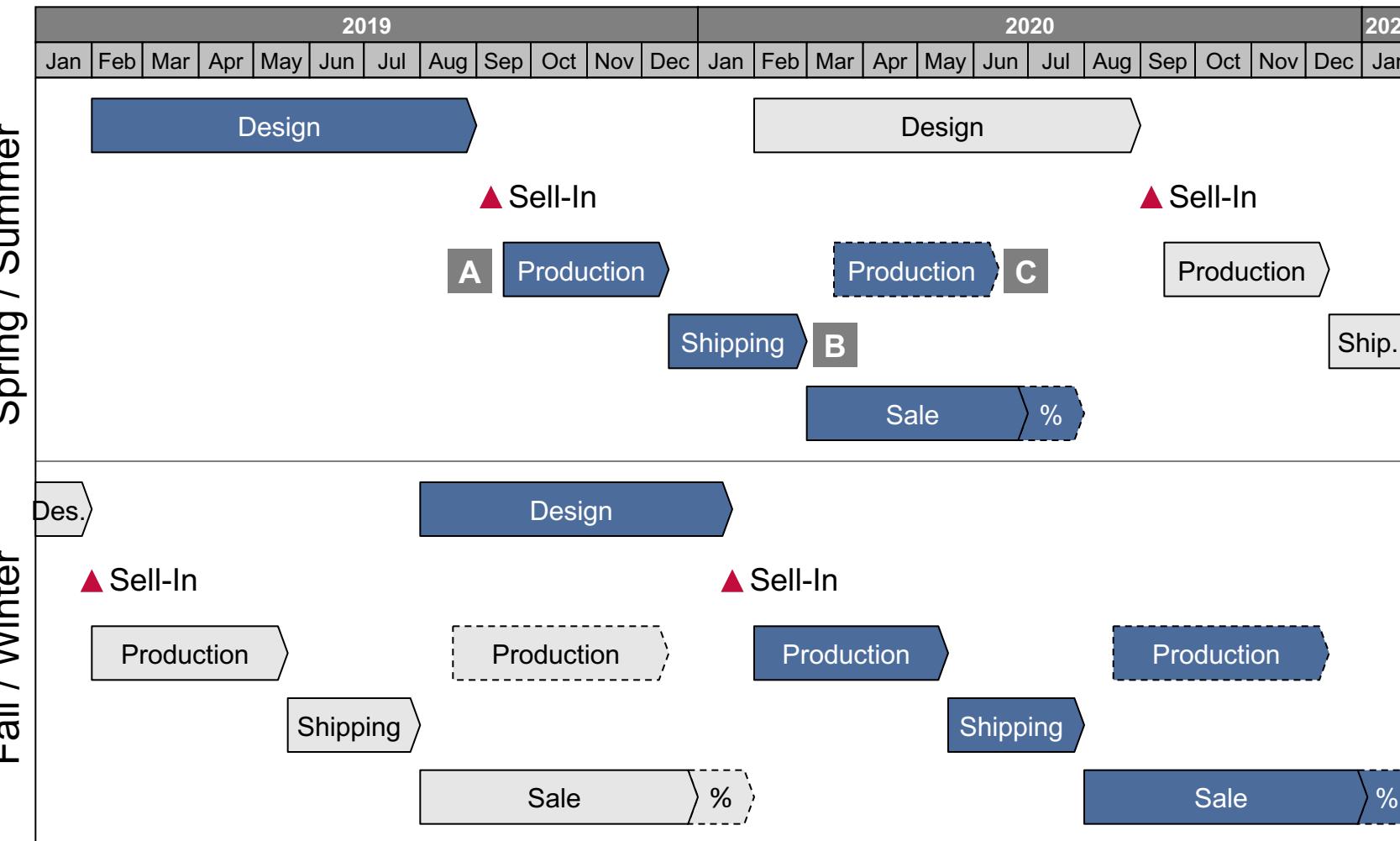
Project scope



# To assess relevant levers for AFR's operational efficiency, a clear understanding of the company's supply and value chain is essential

Supply chain, exemplary seasonal planning

Illustrative



## Pain Points



A Pre season production starts before any sale has occurred

B Produced clothes from China need to be stored until sold

C In-season production can only be delivered with time lag

## Challenge



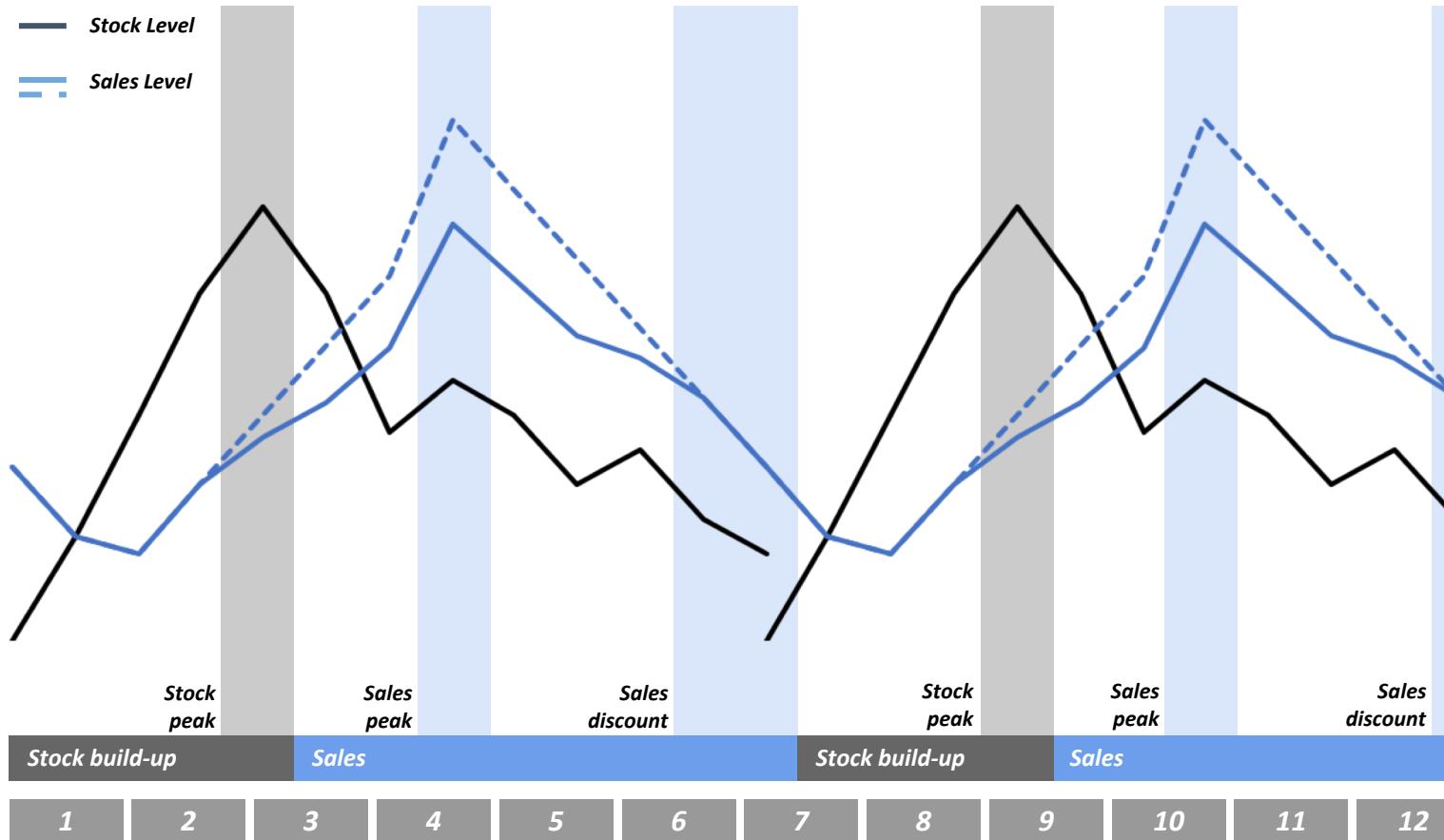
- Long product lead times meeting very short product life cycles – high demand uncertainty

# Through long lead times combined with short product life cycles there is a constant mismatch of product supply and demand

Supply and demand mismatch

Illustrative

**AFR's annual sales cycle**



## Pain Points

- A** Forecast errors leading to supply mismatches
- B** Stock-outs happen and cannibalize potential sales
- C** Unsold stock deteriorates company profitability



## Affected KPIs

- Forecast error
- Stock to sales
- Perfect order performance
- Contribution margin

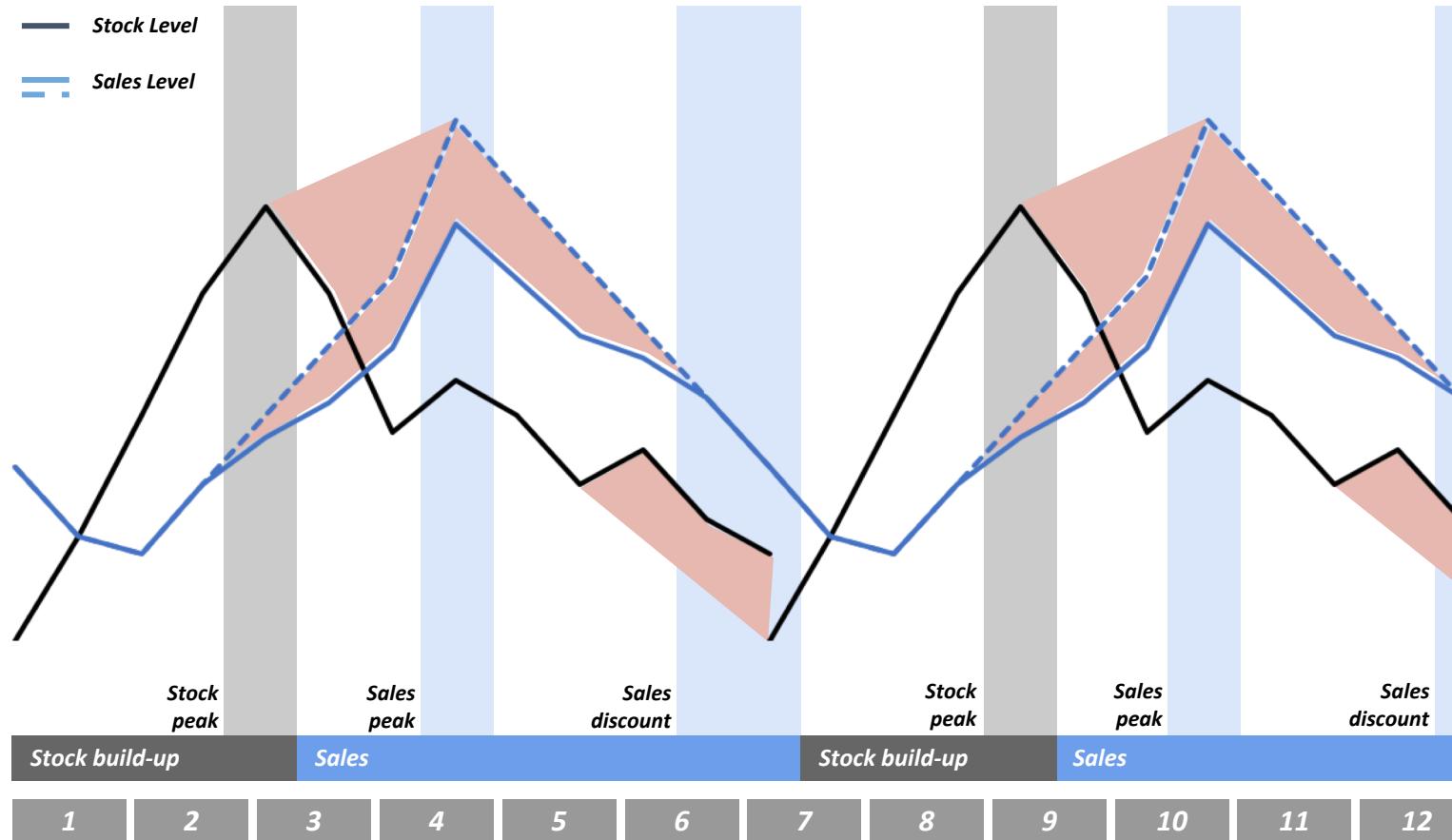


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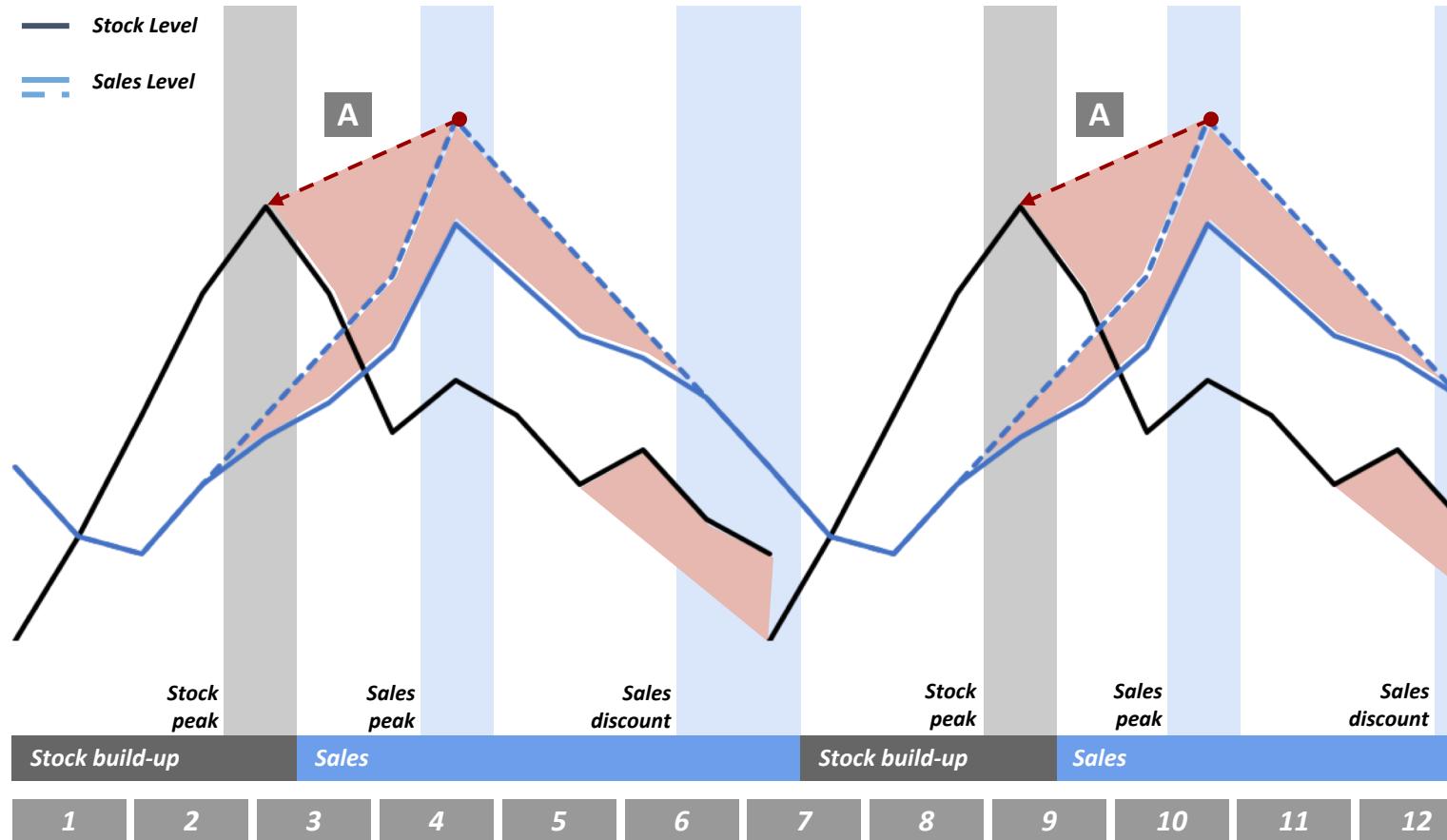


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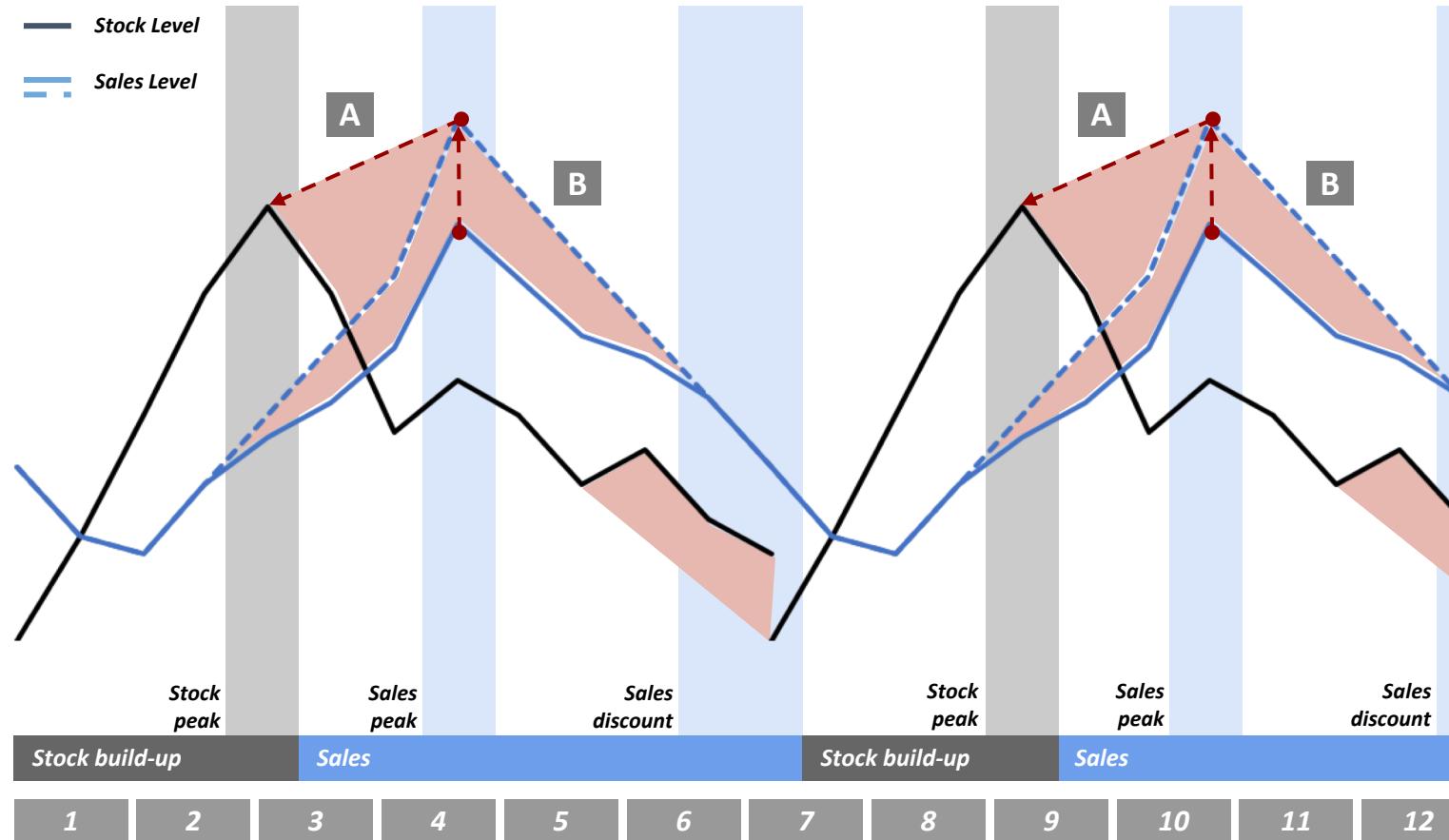


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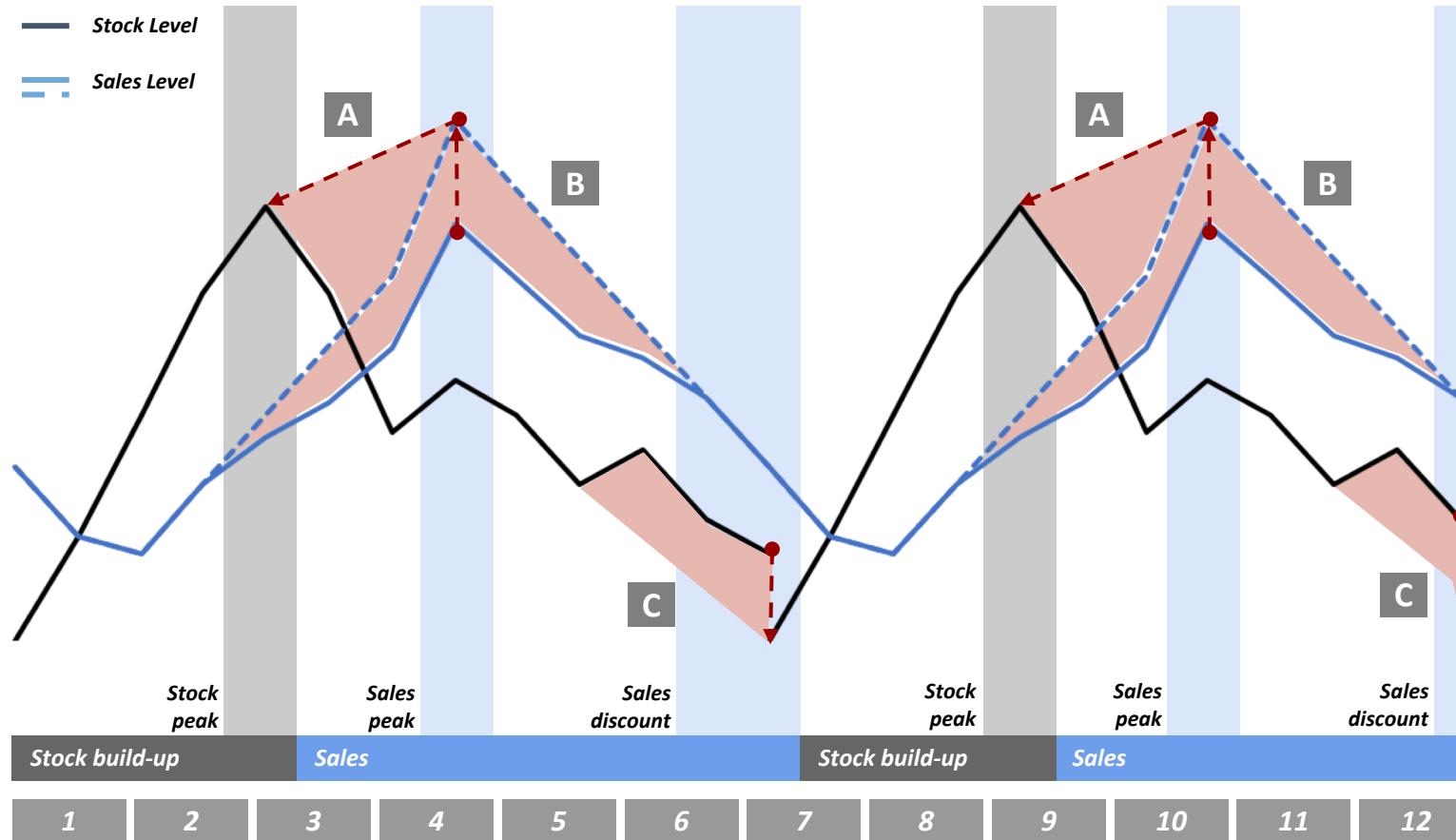


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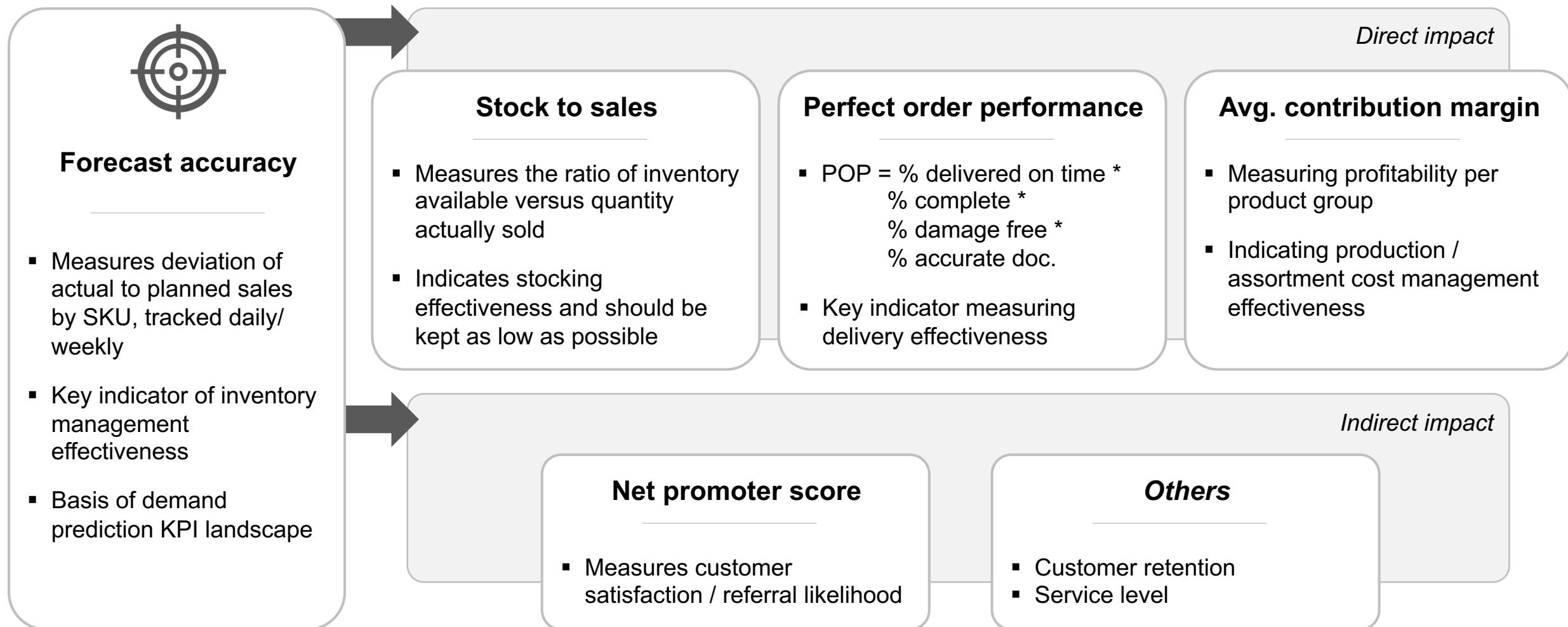
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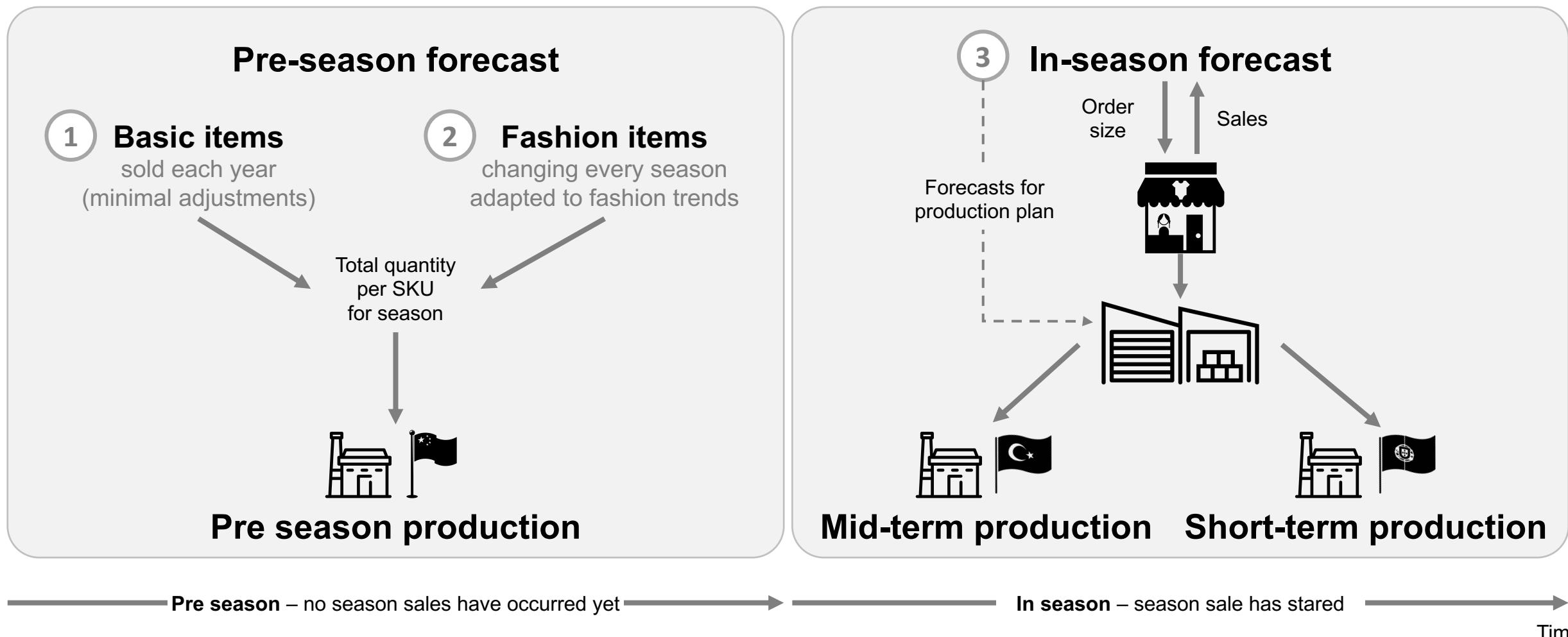
# Forecast accuracy directly and indirectly impacts several KPIs – improving it could lead to significant positive business development for AFR

## KPI landscape



Due to varying data availability and differing production cycles, three different forecasting models are suggested to optimize supply chain management

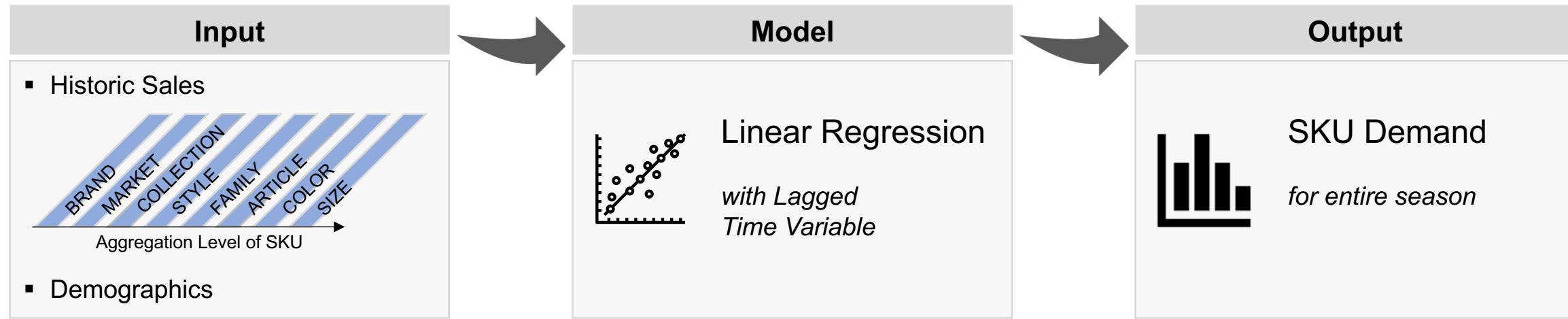
Methodology overview



# Pre-season basics forecasting model will leverage historic sales data and provide demand prediction on SKU level



## ① Pre-season, basics demand forecasting methodology



Illustrative Output:  
SKU1 (Girls, Casual, Jeans, id1, Red, M):  
5.000 units

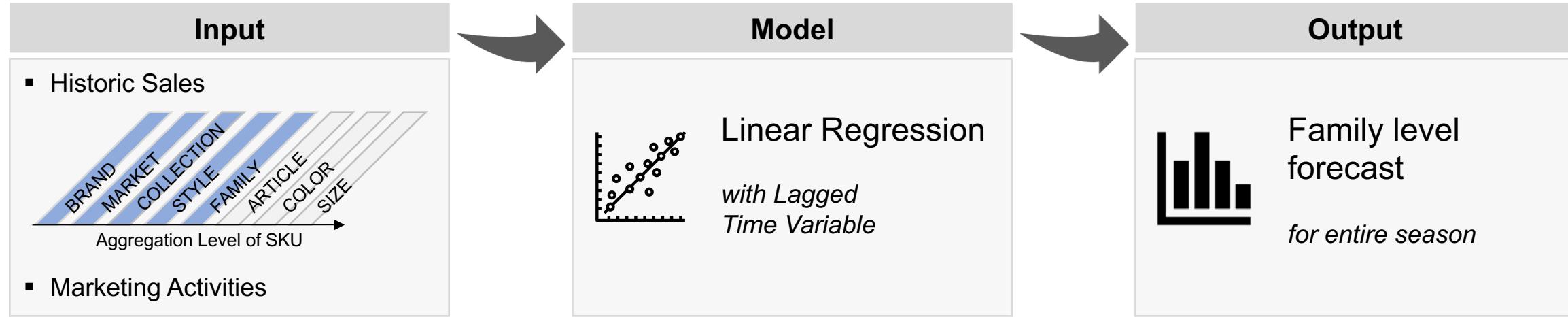
## Consecutive steps



# Due to lack of historic sales data, forecasts can be only on family level but combined with business expert evaluation for final order



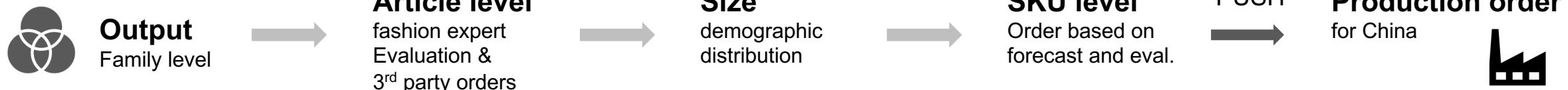
## 2 Pre-season, fashion demand forecasting methodology



### Illustrative Output:

Family 1 (Girls, Casual, Jeans): 20.000 units

### Consecutive steps

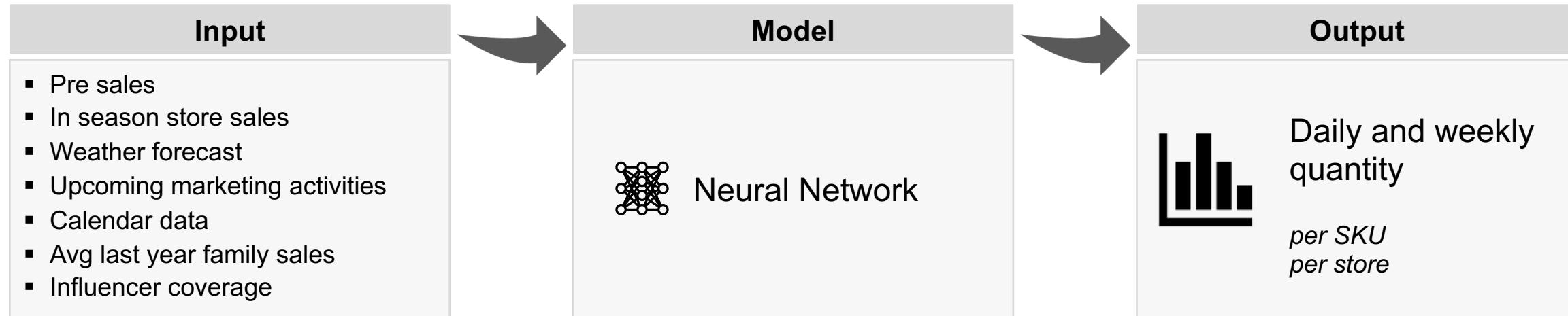


# Replenishment based on in-season forecast leveraging sales information on single-store basis

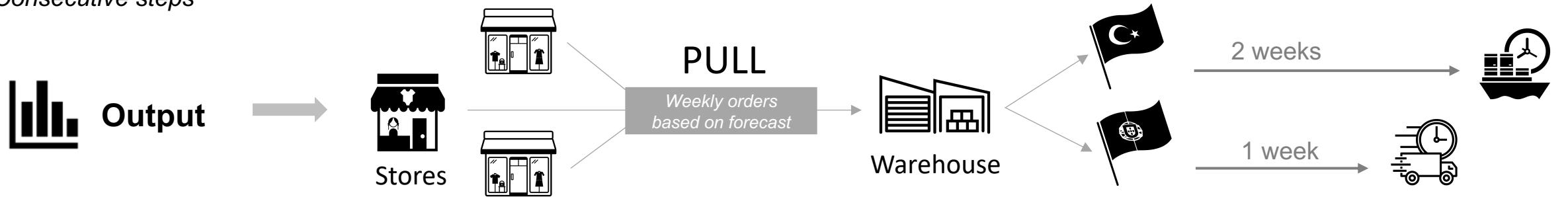


In-Season

## ③ In-season forecast methodology – Store specific models



Consecutive steps



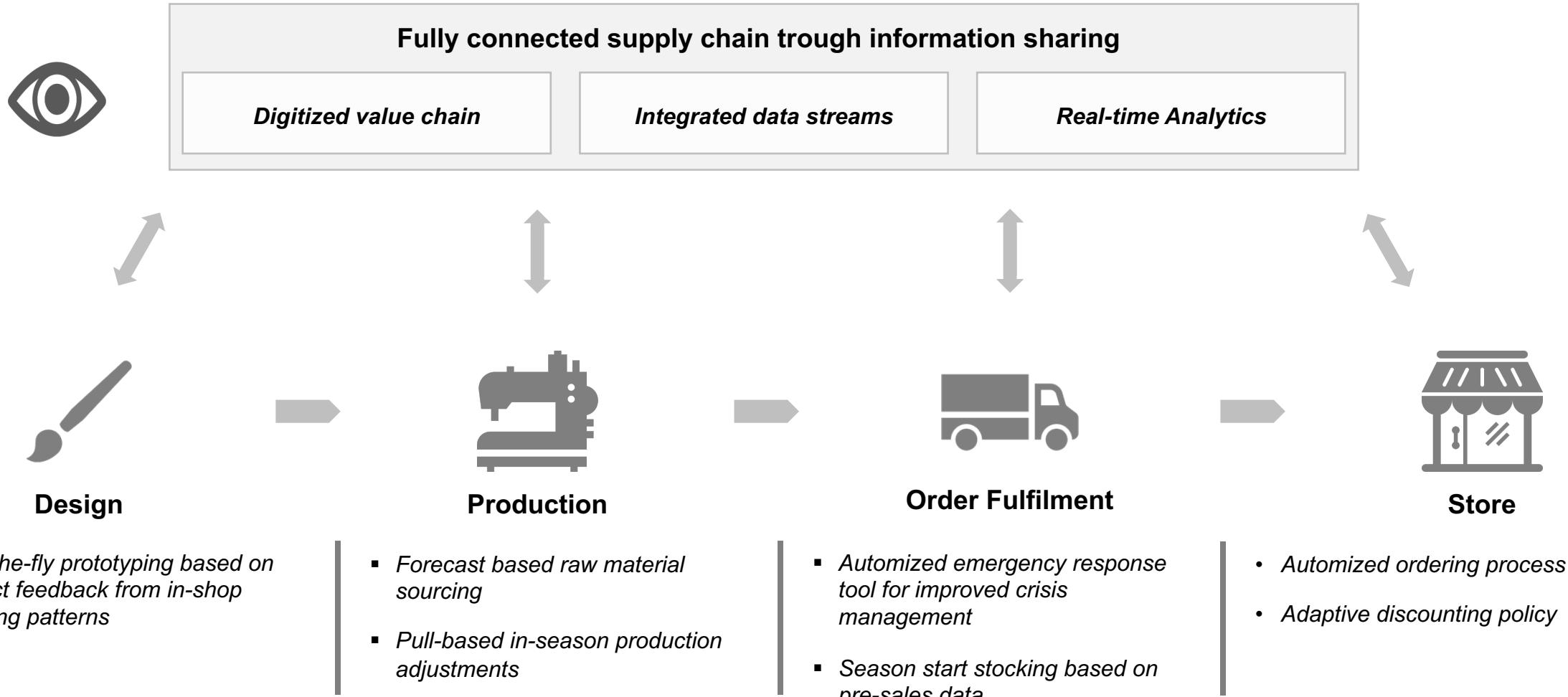
# Our proposed forecasting methodology will result in strong, positive changes for all focus KPIs

Incremental benefits on focus KPIs

KPI	Change	Description	Example
Forecast accuracy		<ul style="list-style-type: none"><li>Leveraging internal and external data using adv. analytics techniques with direct impact on forecast accuracy</li></ul>	<ul style="list-style-type: none"><li>Overall deviation between actual and planned demand will decrease both pre- and in-season</li></ul>
Stock to sales		<ul style="list-style-type: none"><li>Optimizing inventory levels will ensure minimizing days of under- and overstocking in stores</li></ul>	<ul style="list-style-type: none"><li>Especially in more ‘difficult’ planning periods for non-basic products, stocking based on sophisticated planning and not on sporadic purchases is crucial for AFR</li></ul>
Perfect order performance		<ul style="list-style-type: none"><li>Improved on-time delivery both in warehouse and in stores will boost perfect order performance</li></ul>	<ul style="list-style-type: none"><li>Knowing precisely when and where which items are needed, accurate on-time deliveries to warehouse and stores increase</li></ul>
Contribution margin		<ul style="list-style-type: none"><li>Optimizing balanced supply from CN, TR and PT lowers assortment costs</li><li>In-store storing costs lower due to increasing just-in-time delivery</li></ul>	<ul style="list-style-type: none"><li>Produced and stored at lower cost, each item contributes now more positively to AFRs business result</li></ul>
Net promoter score		<ul style="list-style-type: none"><li>Increased customer satisfaction ensured due to better product availability, i.e. less stockouts</li></ul>	<ul style="list-style-type: none"><li>Customers are more likely to give positive feedback or referrals about AFR having experienced a positive (e.g. non-stockout) AFR-experience</li></ul>

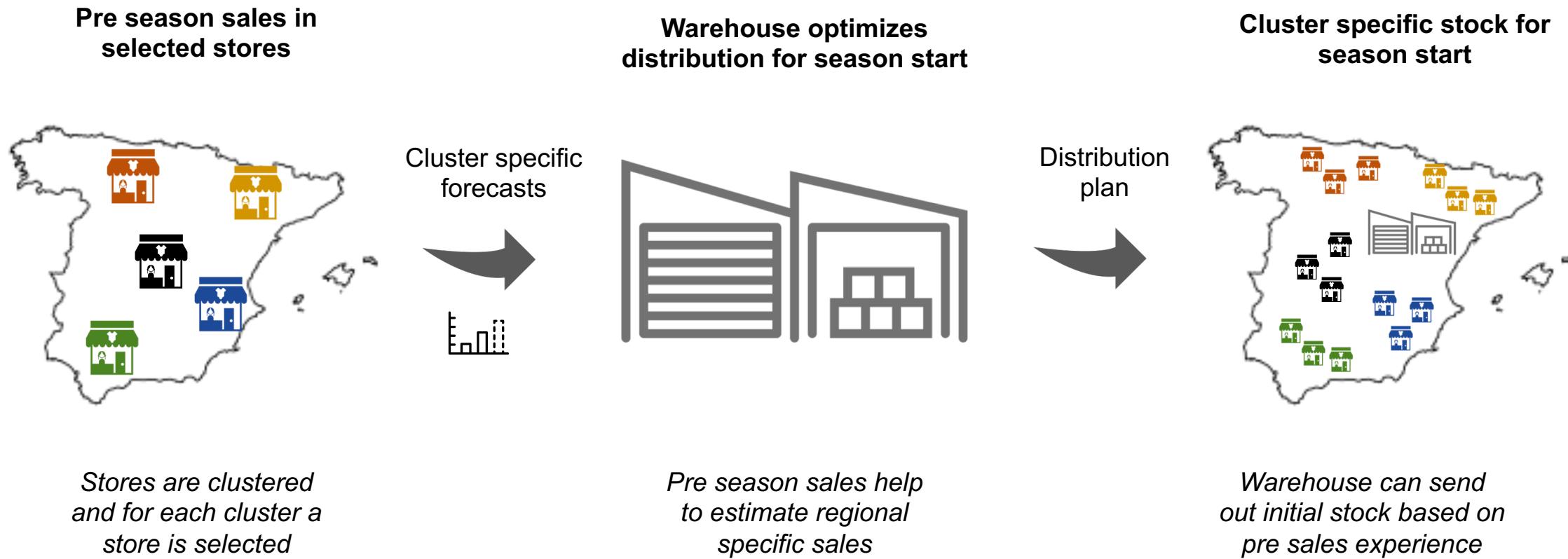
# In the long run AFR will unlock further potential by implementing a more efficient supply chain through data driven automation and decision making

## Supply chain optimization



# Decision making based on advanced analytics creates value across the supply chain but is only successful if operations adopts accordingly

Example: Leveraging pre-sales data



Due to the high complexity of a fashion retailer supply chain the adoption of the new forecasting models should be based on experiences from pilot runs

## Action Plan

	Timeline							Resource requirements <sup>1)</sup>		
	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Data engineer	Data scientist	Business Translator
1	Status quo & stakeholder analysis	4 weeks						High	Low	High
2	Data collection & consolidation	4 weeks						High	Low	High
3	Model design & setup		3 weeks					Mid	High	Low
4	Pilot run			8 weeks				High	Low	High
5	Evaluation & adjustments				3 weeks			High	Low	High
6	Roll out					10 weeks		Low	Low	Low

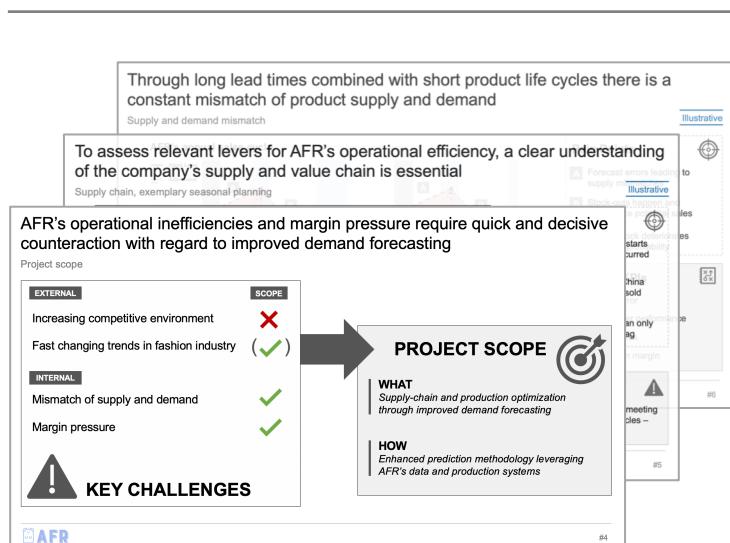
1) Workload:

High Mid Low

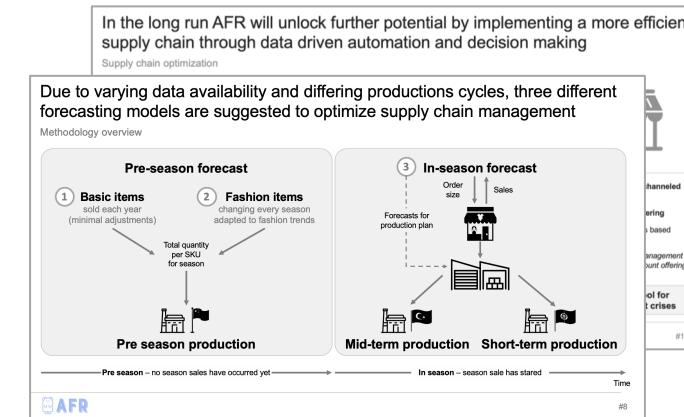
# SCM based on advanced analytics does not only provide incremental benefits but also helps to cope the high demand uncertainty within the fashion industry

## Conclusion

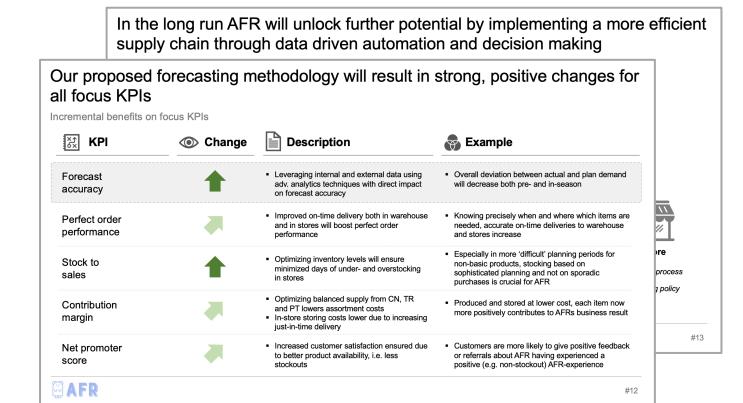
### Status Quo



### Proposed Methodology



### Expected results



- Insufficient SCM resulting in **constant mismatch of supply and demand**, leading to an increasing supply chain cost and margin pressure
- Reducing **forecast error** and thus optimizing replenishment management, reducing operational cost through a more efficient supply chain
- Proposed forecasting methodology will result in **strong, positive changes for all focus KPIs** – additional SCM innovations will further boost AFR's long-term business performance



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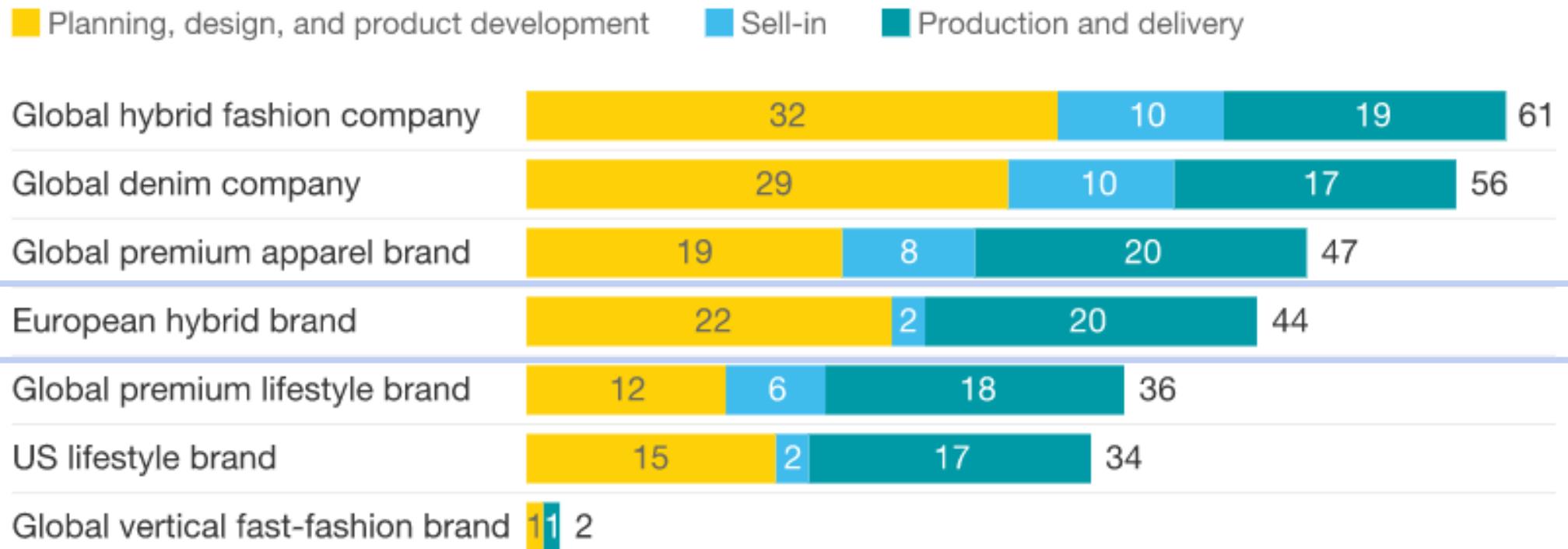
**Thank you for your attention.**

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*Tuesday, June 4<sup>th</sup> 2019*

# Fashion cycle duration varies across industry due to different company profiles and production line set-ups

Overview pre season planning (in weeks)



# AFR three different production sites in China, Turkey and Portugal differ in production cost and delivery times

## Production site overview



### Average production cost



8 USD



16 USD



24 USD



### Arrival time



36 days shipping  
+ 4 days customs



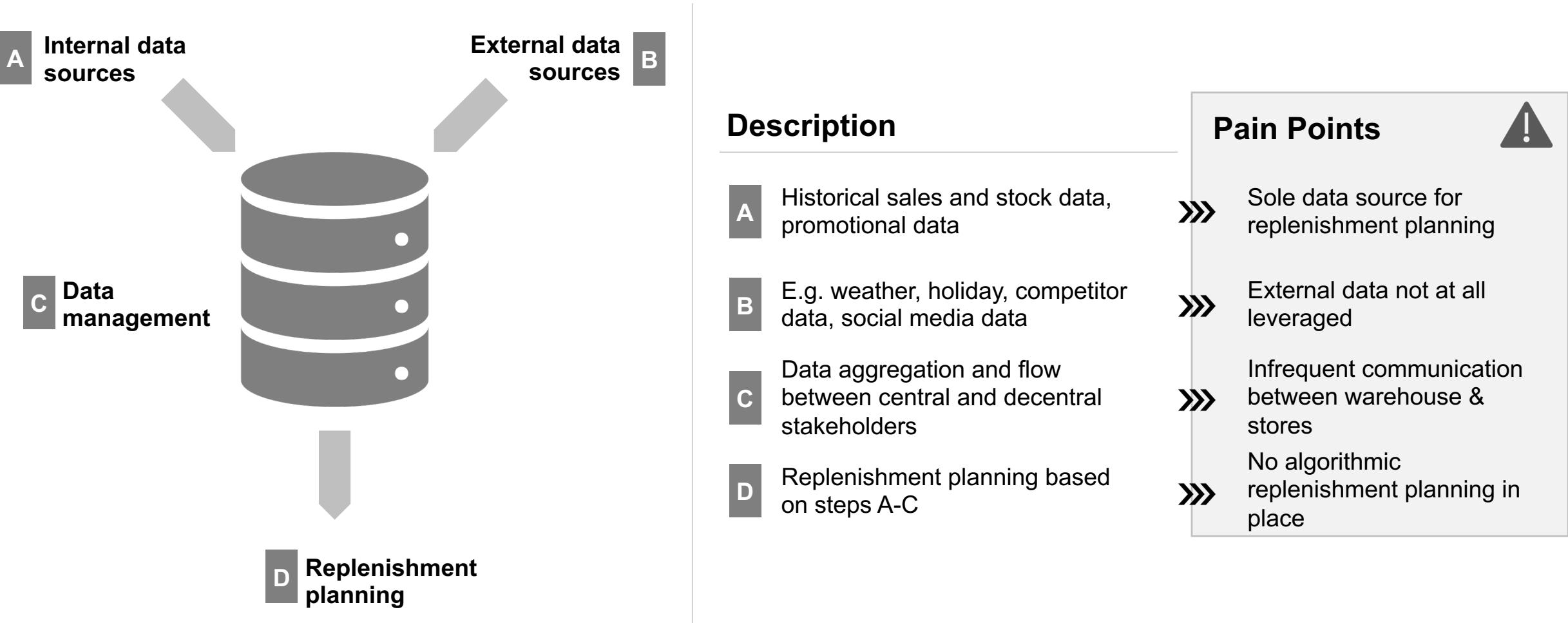
12 – 28 days shipping  
6 – 8 days plane



6 days road delivery

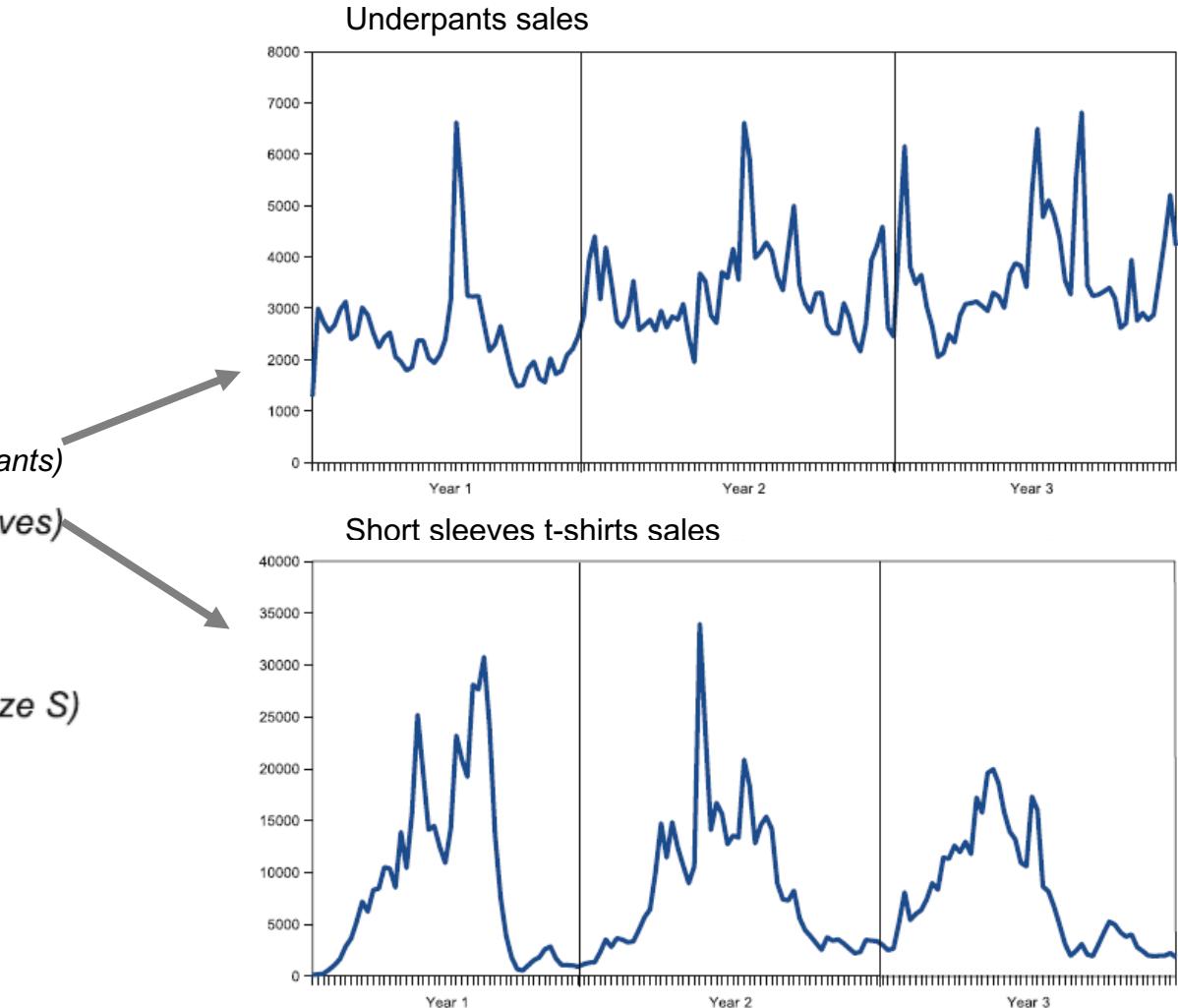
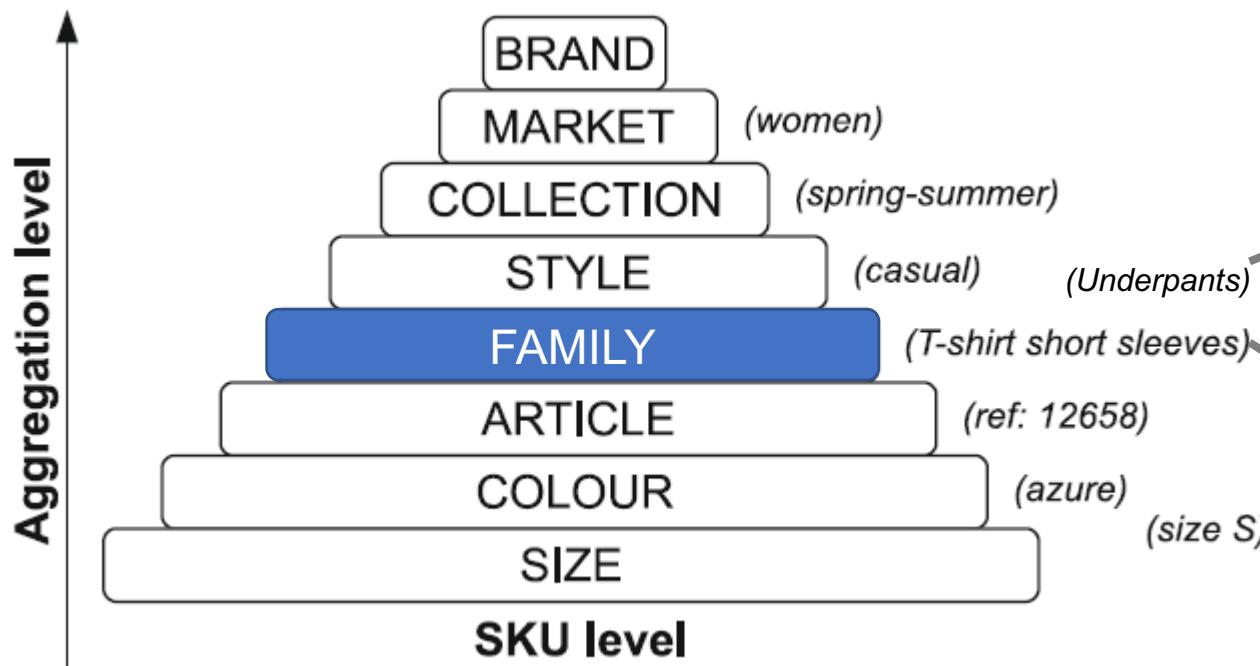
# AFR builds on a sophisticated operational data management system but is not yet leveraging on its full potential

## Data management



# Among fashion item groups differing seasonal variation levels due to group specific sensitivities and sales patterns

Aggregation levels of fashion products



# Fashion demand is influenced by several different factors – some of them can be influenced by the retailer while others cannot and are also difficult to predict

## Demand influence factors

### Under control



**Item features**  
(size, colour, style,...)



**Retailing strategy**  
(number of stores, location,...)



**Marketing strategy**  
(advertising,...)

### Uncontrolled



**Weather data**  
(temp, rainfall,...)



**Competition**  
(offer, promos,...)



**Calendar data**  
(holidays,...)



**Economic trends**  
(purchasing power,...) ( ✓ )

✓ Observable

✗ Not observable

# Machine learning model with lagged time variables takes advantage of historic sales data as well as demographic trends among Spain

Linear model with lagged time variables – Pre season Basics

Illustrative

Historical Data		Demographics					Target	
	Total qty sold Y-1	Total qty sold Y-2	# of children 0-3 mnths Y-1	#of children 0-3 mnths Y-2	...	# of children 11-12 yrs Y-1	# of children 11-12 yrs Y-2	Total quantity
SKU 1-2011	23 500	26 000	#	#	...	#	#	25 000
SKU 1-2012	25 000	23 500	#	#	...	#	#	23 500
SKU 1-2013	23 500	25 000	#	#	...	#	#	24 500
SKU 1-2014	24 500	23 500	#	#	...	#	#	25 500
SKU 1-2015	25 500	24 500	#	#	...	#	#	24 000
...	...	...	...	...	...	...	...	...
SKU 1-2018	25 200	24 700	#	#	...	#	#	26 000
SKU 1-2019	26 000	25 300	#	#	...	#	#	?

Clarifications:

- Values displayed in this tables need to be processed before inputting them in the model
- Depicted values represent aggregated data from previous seasons, not full years' data
- Demographics features presented above are for a generic case. For a specific SKU ONLY certain age ranges will apply, since a specific SKU by definition will suit to certain ages

We will implement our solution in less than 8 mo. with skill sets comprising Data Engineering & Science and Business Translator capabilities for less than 600k

Commercial proposal

		Resource requirements			Commercial Proposal (k EUR)				Workload
		Data engineer	Data scientist	Business Translator	Data engineer	Data scientist	Business Translator	TOTAL	
1	Status quo & stakeholder analysis	4 weeks	Low	Mid	High	Low	Mid	High	Low 0-1 FTE
2	Data collection & consolidation	4 weeks	Mid	Low	Mid	Low	Low	Low	Mid 1-2 FTE
3	Model design & setup	3 weeks	Low	High	Low	High	Low	Low	High 2-3 FTE
4	Pilot run	8 weeks	Mid	High	High	High	High	High	
5	Evaluation & adjustments	3 weeks	Low	Mid	Low	Mid	Low	Low	
6	Roll out	10 weeks	Low	Mid	High	High	High	High	

# Academic resources as well as operational experts are constantly discussing how to optimize supply chains in the fashion industry

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