Zara Uses Operations Research to Reengineer Its Global Distribution Process

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Agenda

Introduction

1. Company Overview
2. Distribution Process
3. Problem: Legacy Distribution Process
4. Solution: The New Process

The Model

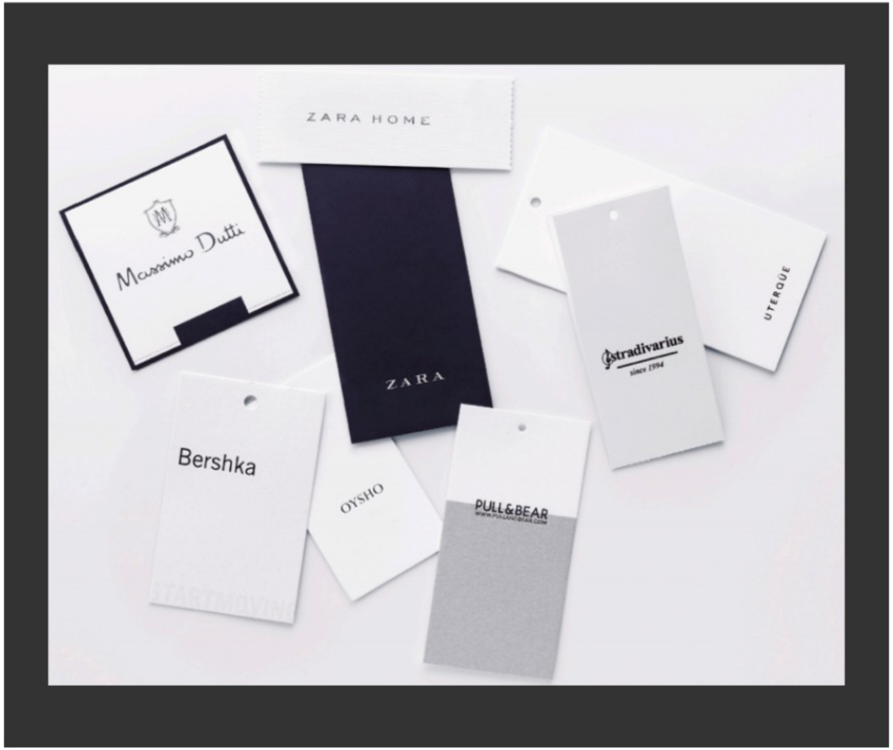
5. Optimization Model

Conclusion

6. Benefit

Company Overview

Inditex Group



- One of the world's largest fashion retailers
- 7,475 stores in 96 markets worldwide
- Eight brands

Zara

The Most Successul Brand of Inditex Group

One of The Biggest International Fashion Companies

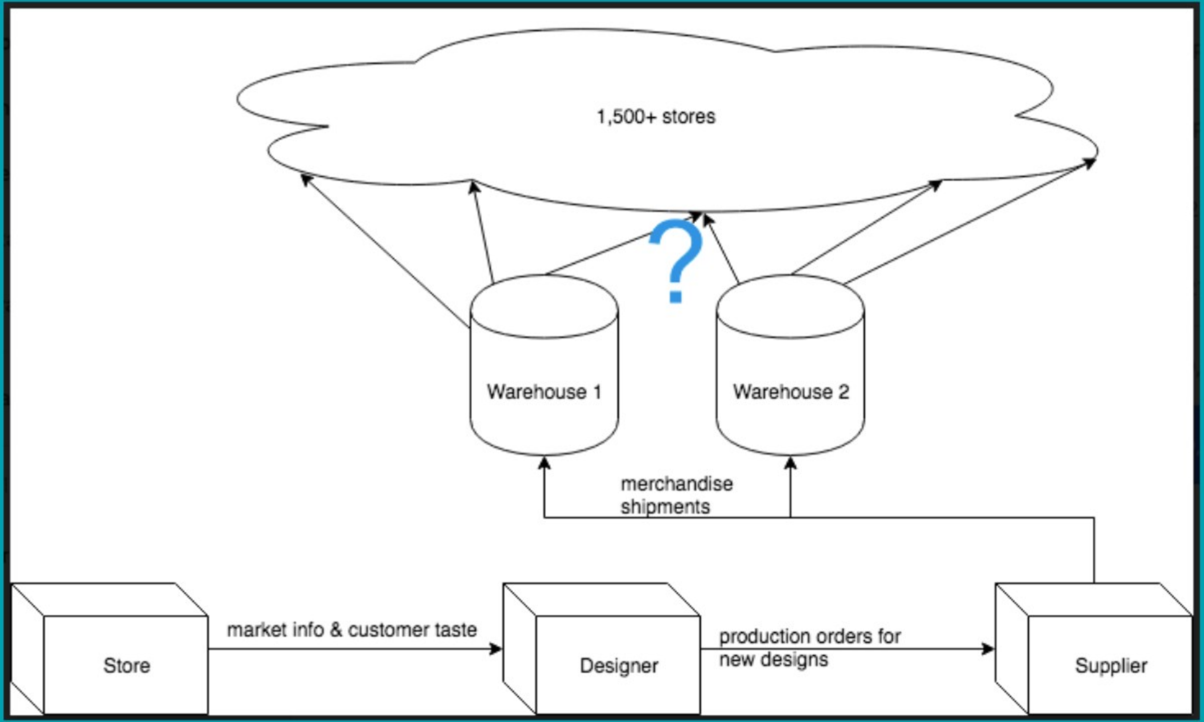
Zara Store

Zara Distribution Center

Distribution Process

Distribute around The World from Spain

Zara's Global Distribution Process

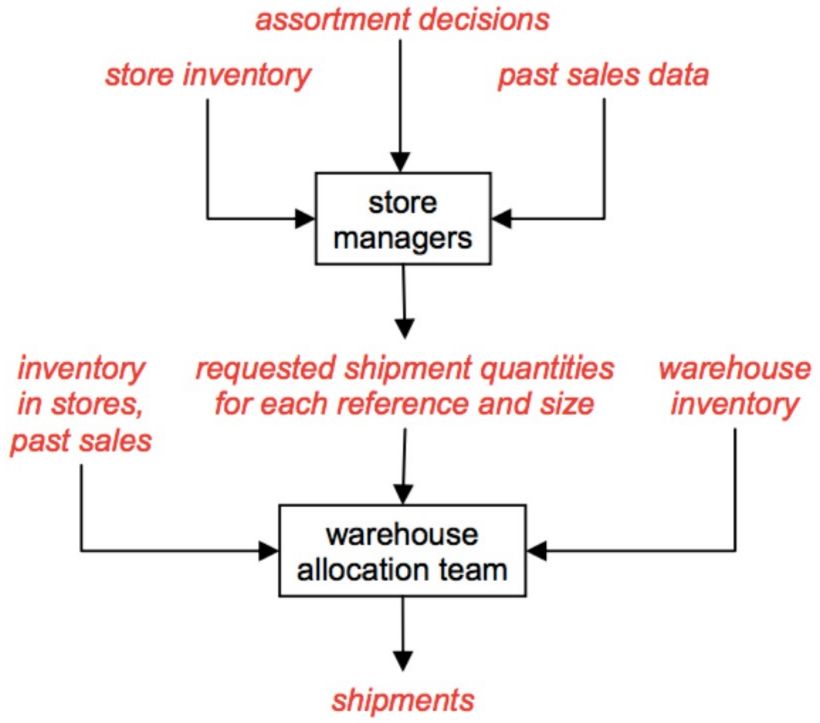


remaining sizes			action
S	M	L	Keep on display
	M	L	Keep on display
S	M		Keep on display
	M		Keep on display
S		L	Move to backroom
S			Move to backroom
		L	Move to backroom

Zara's Inventory Display Policy

- “Major Size” VS “Minor Size”
- Based on customers' feeling
- Goal: promote sales; reduce excess shipment requests

The Problem

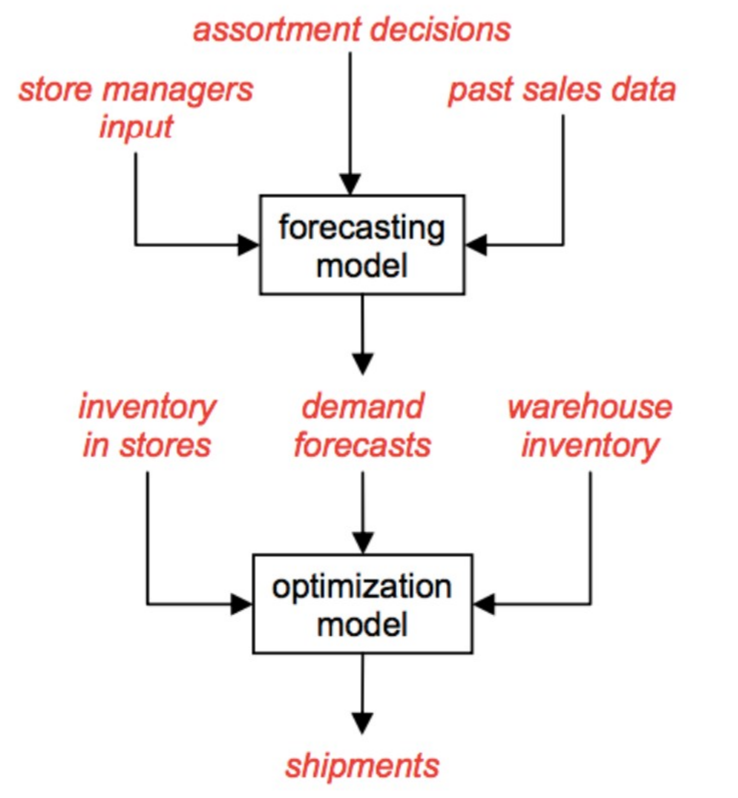


(a) Legacy Process

Legacy Distribution Process

- Can't support the fast-growing distribution network effectively
- Shipment request exceed true needs
- Significant time pressures

Solution



(b) New Process

The New Process

- Demand forecasts: shipment requests and past historical sales
- Optimization model: 1) forecasts; 2)warehouses' and stores' inventory; 3)assortment decisions

Optimization Model

High-level Representation of the Model Formulation

Maximize P*NetworkStoreSales + K*FinalWarehouseStock

Subject to

Shipments <= InitialWarehouseStock

NetworkStoreSales = Inv-to-Sales(StoreInventory + Shipments)

FinalWarehouseStock = InitialWarehouseStock – Shipments

Decision Variables & Objective Function

j = each store

J = set of stores

P = selling price in store j

Z = approximate expected sales across all sizes in each store j

K = aggressiveness factor

S = set of sizes

W = inventory size s available in the warehouse

Decision Variables

$x_{sj} \in N$: Shipment quantity of each size $s \in S$ to each store $j \in J$ for the current replenishment period;

Z_j: The approximate expected sales across all sizes in each store j for the current period under consideration;

$$Max \sum_{j \in J} P_j Z_j + K\left(\sum_{s \in S} \left(W_s - \sum_{j \in J} x_{sj}\right)\right)$$

Constraints

$\Sigma_{j\in J} x_{Sj} \leq w_S$ for all $s \in S$ (warehouse inventory availability)

$z_j \leq (\Sigma_{s\in S} + \lambda_{sj}) y_j + \Sigma_{s\in S-} \lambda_{sj} v_{sj}$ for all $j \in J$ (primary inventory-to-sales function implementation constraint)

$y_j \leq a_i(\lambda_{sj})(I_{sj} + x_{sj} - i) + b_i(\lambda_{sj})$ for all $j \in J$, $s \in S^+$, and $i \in N(\lambda_{sj})$ (secondary inventory-to-sales function implementation constraint)

$v_{sj} \leq \{a_i(\lambda_{sj})(I_{sj} + x_{sj} - i) + b_i(\lambda_{sj})$ for all $j \in J$, $s \in S^-$, and $i \in N(\lambda_{sj})$ (secondary inventory-to-sales function implementation constraint)

$v_{sj} \leq y_j$ for all $j \in J$, $s \in S^-$ (secondary inventory-to-sales function implementation constraint)

$x_{sj} \in N$; $z_j, y_j \geq 0$; $v_{sj} \geq 0$ (nonnegativity and integer constraints)

Input Data

Set of sizes: $S = S^{+} \cup S^{-}$ partitioned into major sizes S^{+} and regular sizes S^{-} (index s);

Set of stores: J (index j);

W_s: Inventory of size s available in the warehouse;

I_{sj}: Inventory of size s available in store j;

P_j: Selling price in store j;

K: Aggressiveness factor (value of inventory remaining in the warehouse after the current shipments);

λ_{sj}: Demand rate for size s in store j;

$N(\lambda_{sj})$: Approximation set for size s in the inventory-to-sales function approximation for store j.

Impact/Benefits

Two-dimension Experiment

Experiment Design

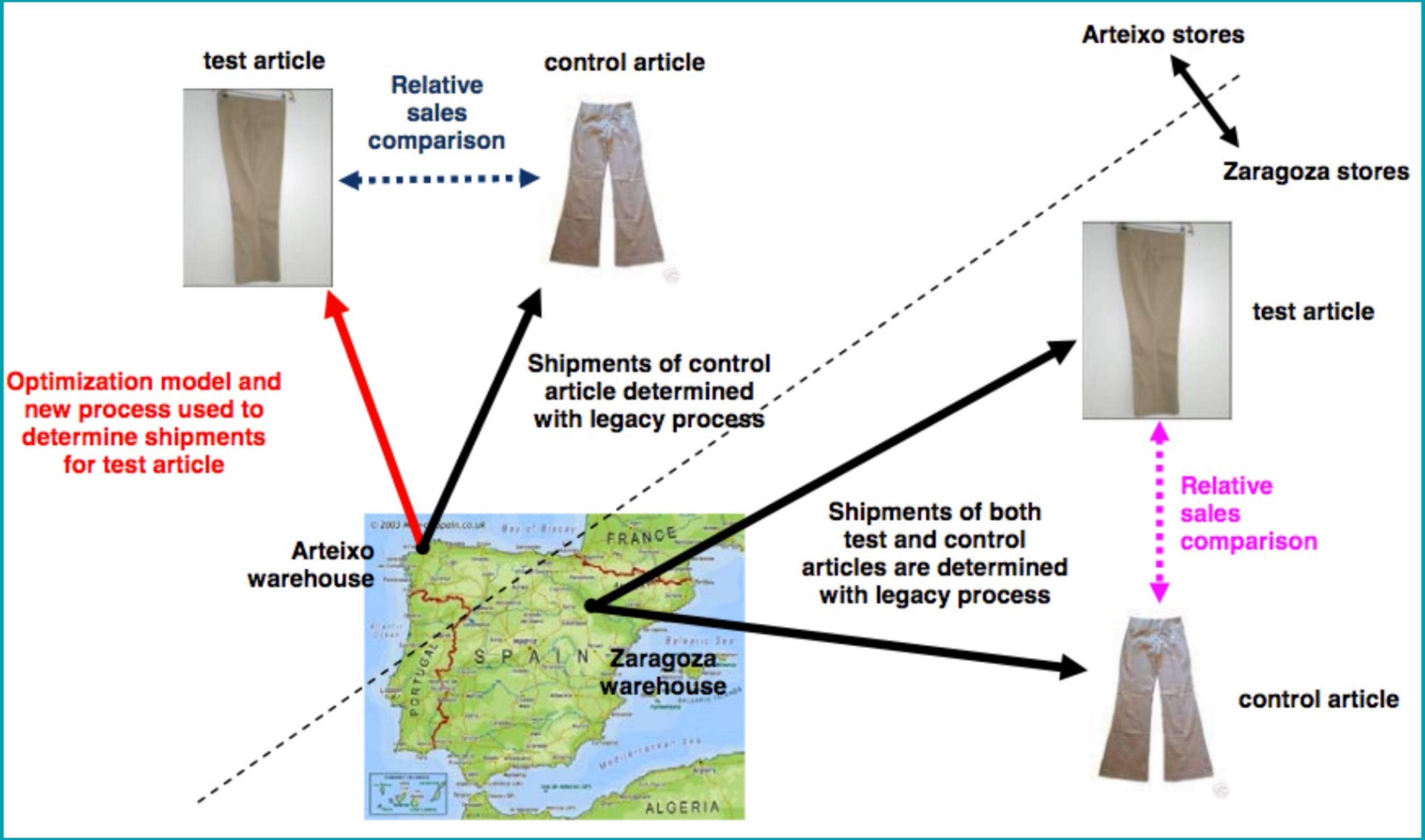
- A live pilot implementation experiment
- Test group: 10 articles of clothing
- Control group: 10 similar articles of clothing

The 1st Dimension

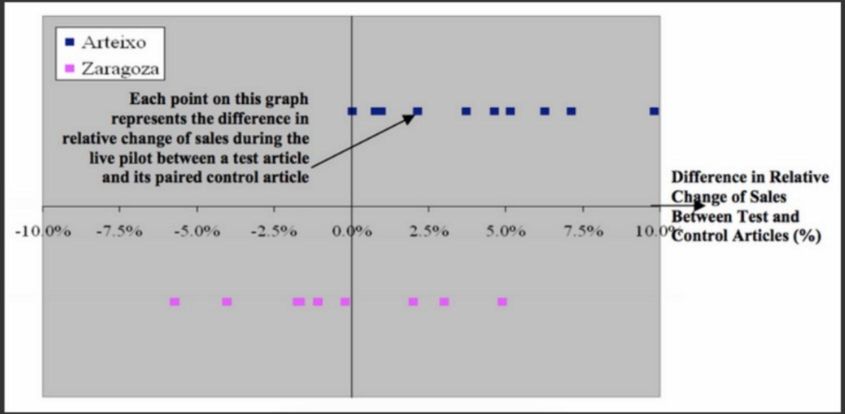
- To Explore the impact brought by the optimization model
- Distribute products to all stores from Zara's warehouse in Arteixo only
- Test group: new model (optimization)
- Control group: legacy process

The 2nd Dimension

- To eliminate the estimation errors
- Both test and control group: legacy process
- Distributing products from another warehouse in Zaragoza to all stores


test article
Relative
sales
comparison
control article
Arteixo stores
Zaragoza stores
Optimization model and
new process used to
determine shipments
for test article
Shipments of control
article determined
with legacy process
test article
Relative
sales
comparison
Shipments of both
test and control
articles are determined
with legacy process
Arteixo
warehouse
Zaragoza
warehouse
control article
FRANCE
SPAIN
PORTUGAL
ALGERIA

Impacts



- **Positive impact on Zara's financial performance**
  - Sales: increase 3-4 percent
  - Additional revenue: $310 million (2007) and $353 million (2008)
  - Additional net income: $37.2 million (2007) and $42.4 million (2008)
- **Better organizational structure and higher efficiency**
  - Employees: focus on more complex and professional responsibilities
  - Employees: gain more enthusiasm and sense of accomplishment
- **More attention to analytical methods**
  - Decision making: data analytics replace judgement
  - Two additional optimization projects for purchasing and pricing

Thank You!