

JUMBO



Master thesis

The Implementation of Expiration Date Visibility at Jumbo Supermarkten

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Introduction

Jumbo Supermarkten

- Market share of 22% on Dutch food retail market
- Approximately 680 stores
 - Opening the first store in Belgium in 2019
- Service-oriented organization
- “Every Day Low Pricing”



Background on replenishment logic

- Replenishment = order new products to supply the store inventory
- Balance between **availability** and waste
- Replenishment with expiration date information:
 - Stores can react on expiration before items actually expire
 - Fewer out-of-stocks

Background on Expiration Date (ED) visibility levels



Item ED visibility

- Products has barcodes with expiration date
- System always knows the expiration dates of items in store exactly



Batch ED visibility

- Register expiration dates at store arrival
- Using a FIFO fraction to estimate which expiration dates are sold

“FIFO fraction = fraction of customers who buys the item with oldest expiration date”

- System estimates the expiration dates of items in store

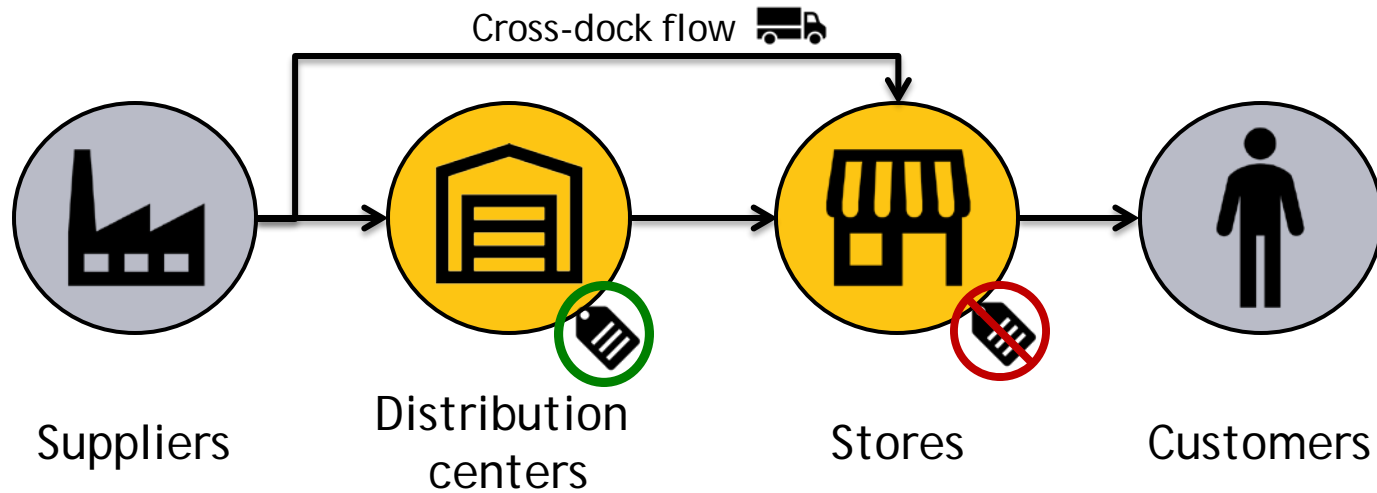
Research question

How should Jumbo register and control the expiration dates of items in the stores?

Analysis & Diagnosis Current Operations

Analysis of Jumbo's operations

- Cross-dock distribution flow > these products are not stored in Jumbo's distribution center.
- Supply chain:



Customer Withdrawal Behavior

Estimation of customer withdrawal behavior: Procedure

- Four constraints
- Three situations (at the end of the day):

FIFO% = 0%

If: **no** customers took a product with expiration date of 1 day left

FIFO% = 100%

If: **all** customers took a product with expiration date of 1 day left

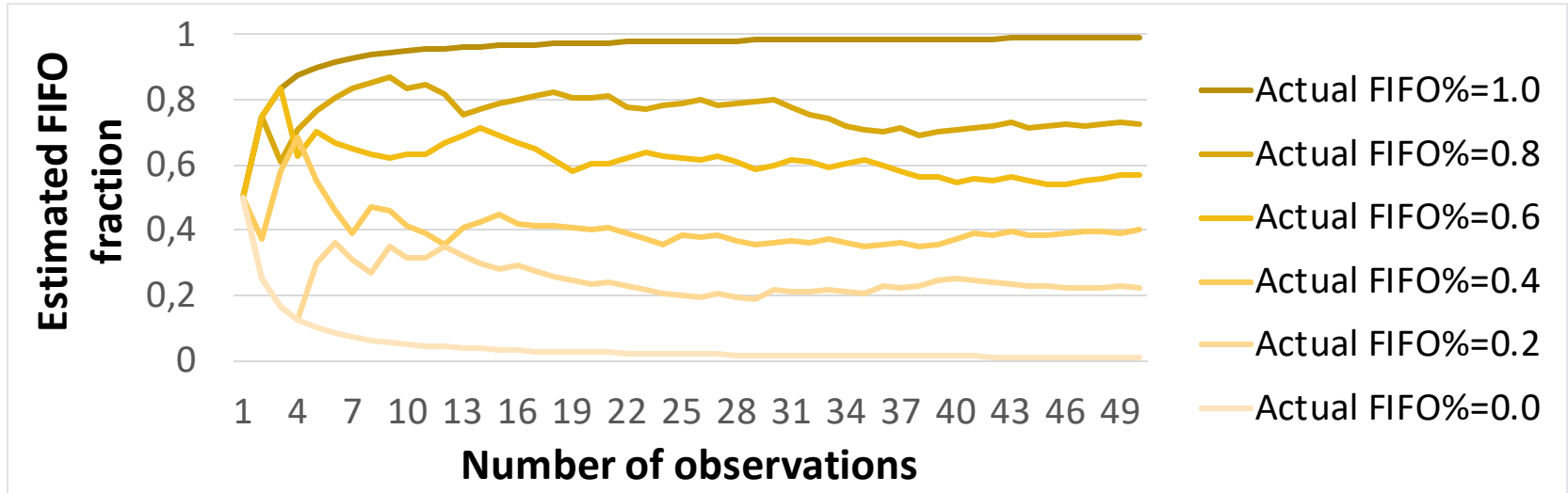
$0% < \text{FIFO}\% < 100\%$

If: all customers had a choice all day.

- $\approx 12\%$ of the days a FIFO% measurement is possible

Estimation of customer withdrawal behaviour: Accuracy curve

- Example of one product:



- 20 observations are required for the estimated fraction to be relatively stable

Estimation of customer withdrawal behaviour: In practice

- FIFO% calculated for 70 Jumbo products in 5 stores (with 6 weeks of data)
- Example of calculated FIFO% for 'processed potato' products:

Table 1; Calculated FIFO fraction of 'Potato processed' products at Jumbo



Product segment	Store 1	Store 2	Store 3	Store 4	Store 5
Potato processed	36%	34%	55%	45%	30%

- Significant correlations are found between the calculated FIFO fractions and some general product characteristics



Performance of Expiration Date visibility

Performance of Expiration Date visibility levels

- Input parameters of simulation experiment represents Jumbo products
- Three scenarios are tested:
 - No expiration date visibility (current situation)
 - Batch expiration date visibility 
 - Item expiration date visibility 

Performance of Expiration Date visibility levels

- Results:




Table 2; Waste reduction of both expiration date visibility levels at a constant availability level (OSA=95%)

Product department	Number of products in simulation	Batch ED visibility	Item ED visibility
Potato/Vegetable/Fruit	95	8.8%	9.3%
Butchery	20	4.8%	6.0%
Fish	9	8.0%	9.3%
Pre-packed meat and salads	19	0.0%	0.0%
Dairy and eggs	127	0.7%	1.5%

Operational changes to implement ED visibility

Operational changes for implementation

Table 3; Indication of difficulty to implement a expiration date visibility scenario.

ED visibility level	 Item ED visibility	 Batch ED visibility: DC-stored products	 Batch ED visibility: cross-dock products
Difficulty of implementation	Very difficult	Easy	Moderate/difficult

Conclusion & Recommendations

Conclusion & recommendations

- ED visibility increases performance for highly perishable items
- Batch level visibility is easier to implement and delivers (almost) the same performance
- Ready-to-cook (NL: Panklaar) product group in Potato/Vegetable/Fruit department has the largest potential performance improvement
 - Thus, Jumbo should start with this product group



Questions

References

- Broekmeulen, R. A. C. M., & Van Donselaar, K.H. (2019). The added value of expiration date visibility, capping order quantities and estimating withdrawal behaviour for perishable items with fixed case pack sizes. University of Technology Eindhoven.

JUMBO

A large, three-dimensional sign spelling 'JUMBO' in bright yellow, block letters is mounted on the exterior of a modern building. The letters are thick and have a slight shadow cast behind them. The building features a glass facade with dark blue or grey frames. The sky is visible through the glass, showing a clear blue color with some light clouds. The overall scene is brightly lit, suggesting a sunny day.