



Optimizing Product Group Segmentation

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Project Team



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Dr. Arntzen is the Executive Director, MIT Supply Chain Management Program. He serves as the faculty advisor, oversees Master's theses, and teaches the course "Global Supply Chain Management."

Project Sponsor

CVS Health Corporation

Headquartered in Woonsocket, RI

Retailer of pharmaceuticals and general health and beauty care products.



Serves 9,800 retail locations nationwide through a network of 19 Distribution Centers (DCs).



Piece picking operations are the largest component in the CVS Retail Logistics payroll.



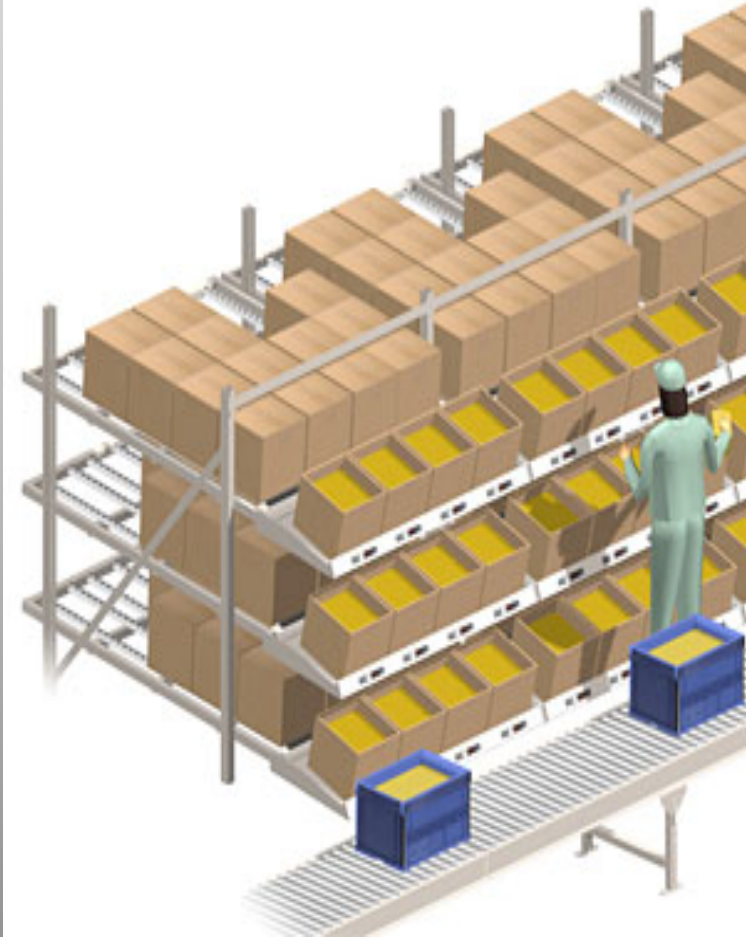
CVS pickers have a 98%+ pick accuracy rate, but continually aim to enhance their operations.

Current Process

Piece picking consists of 2 basic activities:



All pick lists are generated daily from a Warehouse Management System and automatically assigned to specific pickers.





Constraints

Must maintain store service efficiencies

1

No changes to current operation process

2

No more than 4 family groups per tote

3

Consider put-on-shelf efficiency for stores

4

One quadrant per tote





Project Focus

Improve merchandise slotting and assignment planning to optimize space utilization and decrease labor costs.

Step 1



Site Visit & Data Collection

Toured the CVS DC & conducted interviews with operations staff to understand the design and operation of the pick lines.

Step 2



SKU Segmentation & Slot Assignment

Conducted two-staged ABC analysis to segment SKUs based on order frequency.

Step 3



Simulation Modelling

Ran a simulation to compare the travel distance with the old layout and the new proposed layout.



Methodology

A Deep Dive: SKU Segmentation & Slot Assignment

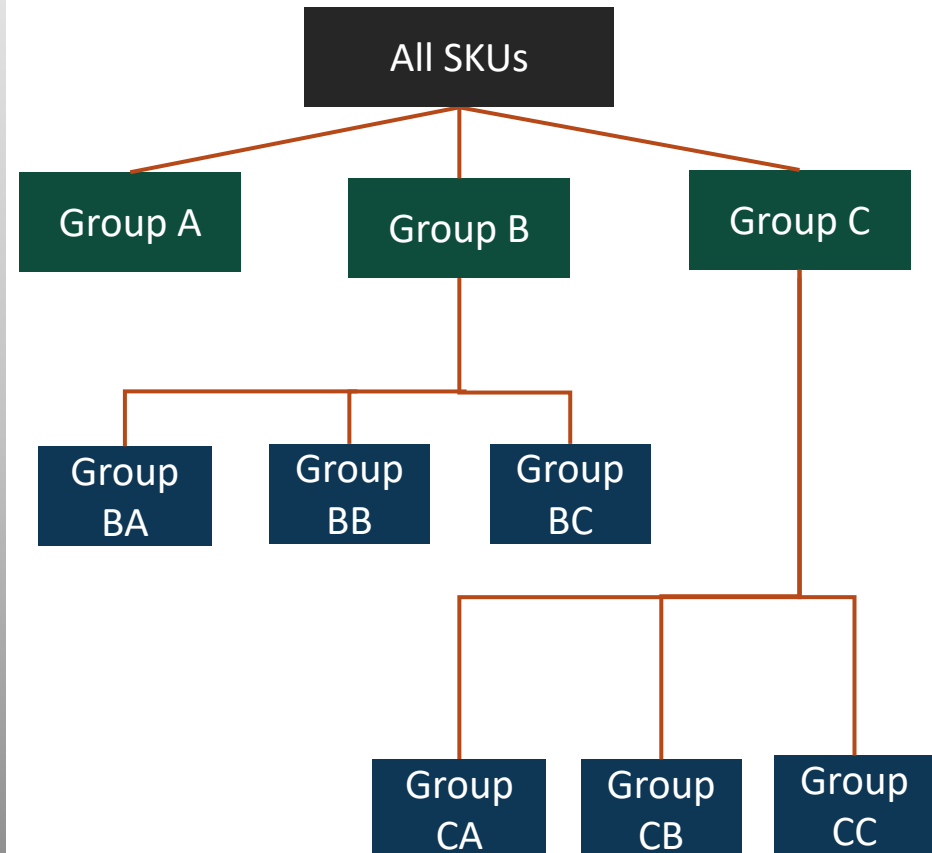
Stage 1

1st ABC segmentation on Section 2E based on moving speed.

- *Group A = Top 70% of aggregated orders*
- *Group B = Between 70% to 90%*
- *Group C = Between 90% to 100%*

Stage 2

2nd ABC segmentation on the medium-slow and slowest movers from stage 1.





Methodology

A Deep Dive: Simulation Modelling



50 randomly generated pick lists

- Based on probability of products being selected

Created 2 Models

- Model A for old slotting
- Model B for new slotting

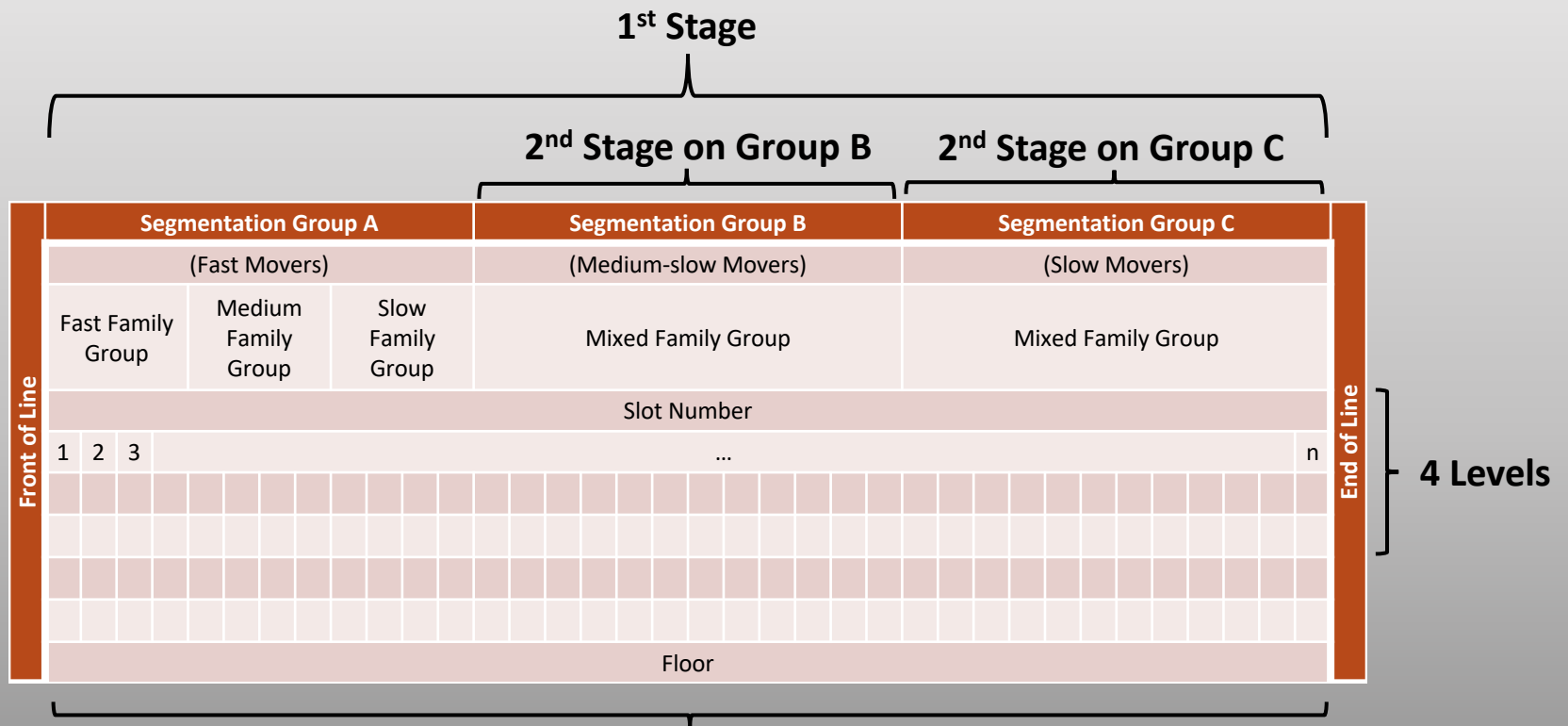
Calculate Distance Travelled

- Compare Distance Savings



Results

Slotting Model



737 SKUs over 184 slots. Each slot occupies same distance.

Section 2E = 200 feet. Each slots \approx 1.806 feet



Results

SKU Segmentation & Slot Assignment

Stage 1

Segmentation	ADULT CARE	BOOKS	HOME DIAGNOSTICS	PERSONAL INTIMACY	SEASONAL WRAP/CARDS	STATIONERY	Grand Total
A	1		1	1		94	97
B	3	1	5			218	227
C	27	33	35	1	6	310	412
Grand Total	31	34	41	2	6	622	736

Out of 737 SKUs, fast movers (Group A) account for 13.18%, medium-slow movers (Group B) account for 30.84% and slow movers (Group C) account for 55.98%.

Segmentation Group A (Fast Movers)					Segmentation Group B (Medium-slow Movers)				Segmentation Group C (Slow Movers)			
Non-Stationary Group		Stationary Family Group			Mixed Family Group				Mixed Family Group			
Slot Number												
1	2	...	23	24	25	...	80	81	82	...	183	184
843387	871509		295436	897850	417075		889949	343380	167700		926077	848267
799520	206417		239527	137143	561293		967097	167415	416152		990516	871418
408683	610709	...	959533	873828	107367	...	315030	392922	889965	...	847681	887813
	848686		841156	455087	854441		268971	870709	974595		848093	986038



Results

SKU Segmentation & Slot Assignment

Stage 2

Segme..		Family Group			
		ADULT CARE	BOOKS	HOME DIAGNOSTICS	STATIONERY
BA	Count of Sku Nbr	3.0	1.0	2.0	130.0
	Avg. Weekly Average	281.3	442.0	271.5	300.2
BB	Count of Sku Nbr			1.0	56.0
	Avg. Weekly Average			206.0	205.3
BC	Count of Sku Nbr			2.0	32.0
	Avg. Weekly Average			172.5	176.7

Segme..		Family Group					
		ADULT CARE	BOOKS	HOME DIAGNOSTICS	PERSONAL INTIMACY	SEASONAL WRAP/CARDS	STATIONERY
CA	Count of Sku Nbr	3.0		6.0		3.0	157.0
	Avg. Weekly Average	93.0		109.3		108.7	121.9
CB	Count of Sku Nbr	1.0	8.0	3.0	1.0	2.0	81.0
	Avg. Weekly Average	65.0	55.0	57.0	62.0	60.5	61.6
CC	Count of Sku Nbr	23.0	25.0	26.0		1.0	72.0
	Avg. Weekly Average	11.2	20.5	16.6		37.0	23.8

Segmentation Group A (Fast Movers)					Segmentation Group B (Medium-slow Movers)				Segmentation Group C (Slow Movers)					
Non-Stationary Group		Stationary Family Group			Mixed Family Group				Mixed Family Group					
		Slot Number												
		1	2	...	23	24	25	...	80	81	82	...	183	184
Front of Line		843387	871509	...	295436	897850	417075	...	889949	343380	167700	...	926077	848267
		799520	206417	...	239527	137143	561293	...	967097	167415	416152	...	990516	871418
		408683	610709	...	959533	873828	107367	...	315030	392922	889965	...	847681	887813
			848686	...	841156	455087	854441	...	268971	870709	974595	...	848093	986038
		Floor												

Results

Simulation Modelling

Step 1

Step 2

Step 3

Pick List Generation

Pick List No.2	
SKU No.	Weekly Average
492324	542
139411	341
427839	321
268614	3401
327072	3309
385609	177
407683	612
198002	170
843189	116
828181	572

Saving Calculation

Pick List No.2				
	Model A		Model B	
Picking Sequence	SKU No.	Slot No.	SKU No.	Slot No.
1	198002	28	407683	1
2	828181	31	268614	3
3	139411	42	327072	3
4	385609	46	828181	19
5	327072	50	492324	20
6	843189	52	139411	34
7	268614	131	427839	36
8	407683	151	385609	77
9	492324	169	198002	79
10	427839	185	843189	105
Travel Interval	157		104	
Saving	53			



Results

Simulation Modelling

Step 1

Step 2

Step 3



Model Comparison

Positive Saving

•72%

Average Saving

•27.62%

Savings in Slot

•34.54

Savings in Feet

•37.51 per Pick List



Recommendation

CVS SKU Segmentation

We recommend that CVS break product categories to improve pick efficiency.

- Two-Staged ABC Analysis

Segmentation

- 27.62% Travel Distance Saving

Pick Efficiency

Future Improvements

SKU size

- Include size variation of slots

Travel Distance between Pick Lists

- Add up travel distance between pick lists

Cost Analysis

- Further analyze the result in terms of cost savings