Optimizing Product Group Segmentation

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Abstract

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by Anushka Budhiraj and Ye Du

Submitted to the Engineering Systems Division on May 11, 2018 in Partial Fulfillment of the Requirements for the Degree of Master of Applied Science in Supply Chain Management.

Piece picking is an integral operation in distribution centres (DCs). The partner company has it as the largest part cost item of DC operations. The current product slotting and assignment planning needs to be improved to improve space utilization and reduce labour expenses. The team approached the problem by using a two-staged ABC segmentation method to determine the a more efficient slotting. The derived slot assignment results in an average saving of 27.62% in travel distance. This Capstone therefore offers a novel perspective into piece-picking optimization and improves efficiency and cost effectiveness.

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1. Introduction

CVS Health Corporation, headquartered in Woonsocket, RI, is a retailer of pharmaceuticals and general health and beauty care products. CVS processes and ships orders to 9,800 retail locations nationwide through a network of 19 Distribution Centers (DCs). Piece picking is one of the components in CVS's DC operations. Piece Pick operations are the largest component in the CVS Retail Logistics payroll. Most picks are done from paper documents indicating the location, store, item, and order quantity. Piece picking consists of 2 basic activities – 1.) travelling to the pick location and 2.) picking product from the flow rack location and placing it into the store order tote. All pick lists are generated daily from a Warehouse Management System and are automatically assigned to specific pickers. CVS pickers have a 98%+ pick accuracy rate.

1.1 Research Motivation

Piece Picking is one of the most basic warehousing processes and the accuracy of the orders and the efficiency of the picking can decrease costs and ensure product availability in retail locations. Due to these impacts, it is one of the most controlled warehousing activities in Supply chain. Due to the steep cost of automation we are focusing on alternative methods of optimizing current operations. The objective of our project is to improve CVS DC's merchandise slotting and assignment planning to improve the space utilization and labour costs. The findings from this research may be implemented across the CVS Distribution Centers.

1.2 Problem Description

The layout of the product in the pick racks is typically in product "Family Groupings" with other constraints introduced for store service efficiencies. The product layout is subject to the following set of constraints, which are described further in the Methodology section:

- No Change to Current Operational Process
- No more than 4 Family Groups per Tote
- Put-on-Shelf Efficiency for CVS Stores
- 1 Quadrant per Tote

The current layout results in a significant walk for the pickers. Thus, the process is extremely labour intensive. The current product "slotting" and assignment planning needs to be improved to reduce labour expenses and improve space utilization.

1.3 Capstone Structure

The Capstone continues as follows. In Chapter 2, we provide a review of the relevant literature and methodology used in other research. In Chapter 3, we provide the methodology, various assumptions and the conceptual flow of our research and model. In Chapter 4, we document the model, and the results of each simulation run. Finally, in Chapter 5, we conclude by providing overall observations and implications of our research, key insights, and recommendations for future research.

2. Literature Review

This chapter introduces order picking operations in distribution centers (DCs), reviews CVS's current picking activities and examines the use of SKU segmentation for picking productivity improvement.

2.1 Order Picking Operations

Order picking is the most labor-intensive (De Koster, Le-Duc, Roodbergen, 2007) and most time-consuming operation in warehouses or distribution centers (Roodbergen & De Koster, 2001) and accounts for 65% of all WH operating expenses (Weisner & Deuse, 2014). The time it takes to complete order processing is an important part of customer service and affects customer satisfaction ((Khan, Dong, & Yu, 2017)). Therefore, order picking operations call for productivity improvement (De Koster, Le-Duc, Roodbergen, 2007).

2.2 CVS Order Picking Practices

Richards (2018) summarizes picking strategies by 6 categories, namely picker, orders, handling equipment, storage method, pick operations and software system. Following this category order, CVS adopts strategies of pickers to goods, order picking, order pickers, conventional racking, paper pick and WMS (Warehouse Management System).

A picking trip is the process of executing a pick list by visiting the bins. Pickers to goods refers to the practice of conducting the picking trip by the picker to retrieve the assignments (Richards, 2018). If a trip includes one order, the process is called order-based picking (Berg, 2007). CVS utilizes zone-picking to divide the pick area into zones and each zone is assigned to one picker. Pickers collect paper pick lists generated by the WMS which designates pick items and sequence. Then pickers pick orders located in designated zone, one order at a time (Tompkins White & Tanchoco, 2010). Zone picking contributes to less congestion and higher efficiency by allowing pickers to familiarize themselves with items and travel relatively short distances (De Koster, Le-Duc, Roodbergen, 2007).

2.3 Segmentation

We have considered other picking strategies for this project:

- Batch Picking (pick assignment includes more than one order)
- Custer Picking (pick multiple orders concurrently and assign to individual bins)
- Wave Picking (combine and release orders at specific times)
- Vision picking or voice picking (Richards, 2018)

However, they do not meet the requirements of this project due to the constraint of maintaining existing picking practices. This capstone approaches picking improvement from a different perspective by changing SKU slotting through SKU segmentation.

The ABC parameter refers to the SKUs demand profile. For instance, an 80/20 parameter indicates 20% of the SKUs account for 80% of activity ((Khan, Dong, & Yu, 2017). Li and Nof (2016) combine ABC analysis and the mutual affinity of products to develop an integrated mechanism for storage assignment optimization. The products are assigned to certain rows based on their affinity and ABC classification. The products are assigned to Area A, B and C in descending order frequency.

CVS stores are divided into 4 quadrants, each containing merchandise belonging to certain family groups. Therefore, the CVS DC has constraints requiring the grouping of SKUs belonging to the same quadrant and of combining no more than 3 family groups in the same tote.

Because of these constraints, together with lack of order history from individual store, this project does not measure affinity among products and proposes a two-stage ABC classification.

3. Methodology

In this chapter, we outline how the data was collected, the constraints and the rationale for the methodology. We explain how we used the simulation model to better understand the impact of the new rack layout on pick efficiency.

3.1. Scope

Our research is limited to the products, product groups, and rack layout of Woonsocket DC. It is focused on the following pick lines in CVS's Woonsocket DC. The Section 2E contains primarily Stationary SKUs, while other pick lines focused contain majorly Health and Beauty Care SKUs. The lines were selected qualitatively through observations made during the site visit and through the recommendation of the DC staff.

Table 1: Scope

Line Name	Primary Products in line	Observed Movement Speed	Observed Pickers Assigned
2E	Stationary	Slow	One
Multiple	Health and Beauty Care	Fast	>3

3.2. Site Visit

We toured the CVS Distribution Center in Woonsocket, Rhode Island and conducted interviews with the DC operations staff to become familiar with the design and operation of the pick lines.

3.2.1 DC Layout

During the site visit we had an opportunity to see the slow and fast-moving lines. Each of the fast-moving lines with items such as coffee and soaps have multiple pickers assigned. Meanwhile the slow-moving aisles with items such as stationary will have one picker assigned The DC is organized per the diagram below. Our research focuses on the pick lines labelled "Pick Line Modules A-L".

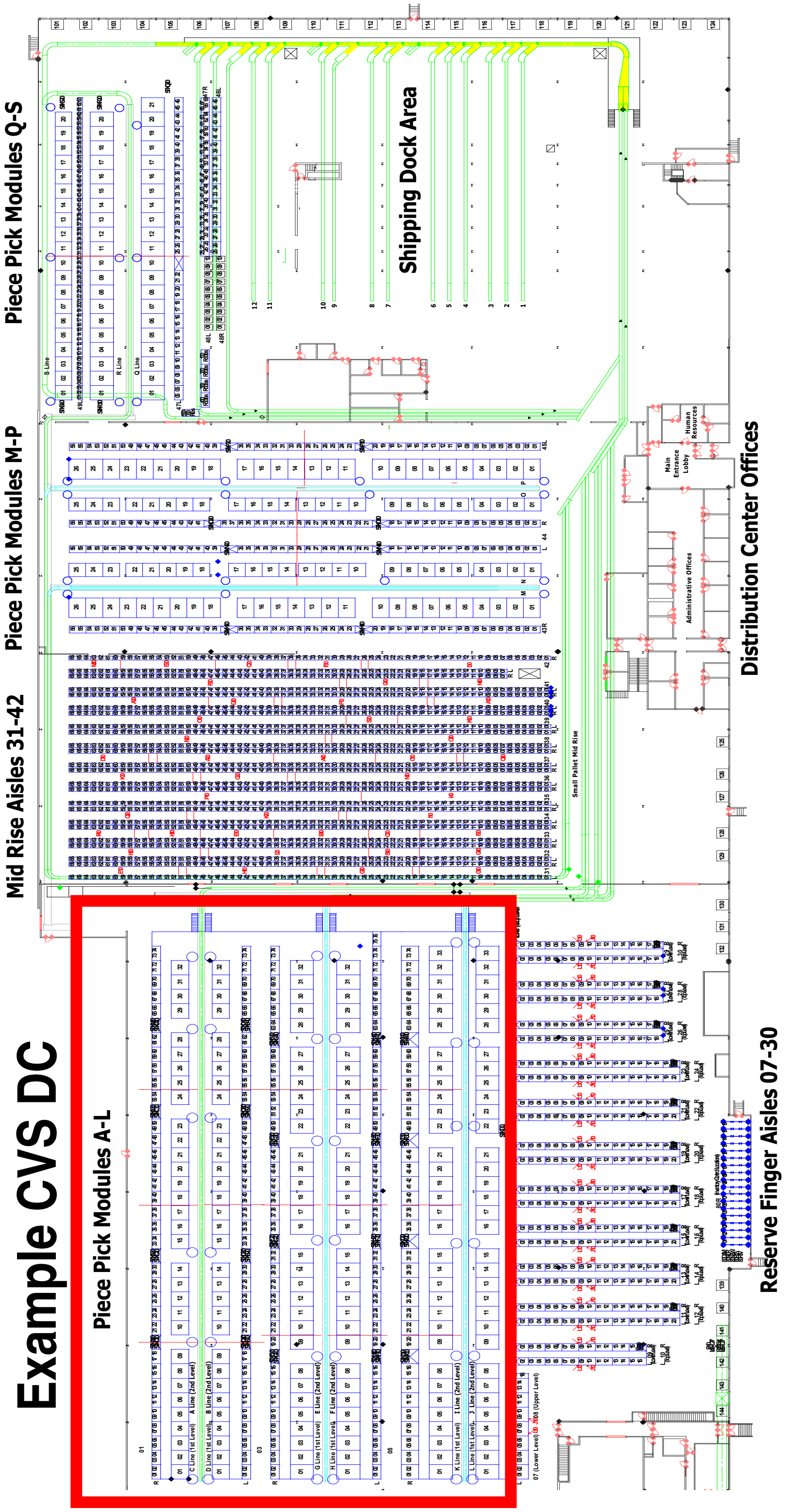

Figure 1: DC Layout

3.2.2 Pick Lists

CVS uses paper documents to conduct their piece picking. Each day a new batch of pick lists is printed and assigned to pickers. Each aisle is divided into one or many zones depending on the product categories and the moving speed of the items. Each picker is responsible for picking orders for one zone only. However, the size of each zone may increase or decreased daily and hence the number of pickers assigned to each line may increase or decrease as well. A store may have one or many pick lists. Figure 2 below displays the pick list for one tote.

Figure 2: Pick List

Following the tour, we worked with the DC staff to flow chart the processes and narrowed down the scope of the research to be purely based on the re-categorization of the product groups to decrease distance walked during pick assignments.

3.3 Data Collection

All data was provided to us by CVS. Some qualitative information was collected through informal interviews with the CVS Point of Contact in weekly meetings. We did not conduct formal surveys. We received the following data files:

Table 2: Data Summary

Name	**Description**	**Format**
Woonsocket Quadrant data	Item "Quadrant affinity" for the DC	Excel
WN_Orderlines_Past12Months_A_Crosstab	Item "Movement affinity" by week	Excel
WN_ItemAttributes_A	Item "DC master data" which shows where the SKU is currently located and other control information.	Excel
WDC_Line2ESKUsandPrimaryLocationAssignments	Slotting location assignment file for all the SKU's on Line 2E	Excel
WDC_PickAssignments_March1st_Section2E	Pick assignments (the data equivalent of the paper assignments)	Excel
WDC_PickActivity_March1st_Section2E	Pick activity (specific totes and stores the picks were for)	Excel
WN_Section2E_ItemAttributes	Item "DC master data" which shows where the SKU is currently located and other control information for line 2E	Excel
MIT2018_SKUORDERFREQBYWEEKNO[2]	Order history data	Excel
Multiple Files	Data Dictionary	Excel

3.4 Constraints

Our research was subject to the following set of constraints:

- **No Change to Current Operational Process:** CVS requested that our research be focused on changing SKUs slotting through SKU segmentation rather than changing existing CVS processes.
- **No more than 4 Family Groups per Tote:** This is a requirement to ensure product quality through the delivery process. CVS maintains strict quality standards so that products such aerosols are not in the same totes as diapers or food items.
- **Put-on-Shelf Efficiency for CVS Stores:** All totes are organized in a manner that allows for items to be easily put away in the stores. All stores are organized by product category and item affinity. We had to ensure any changes we recommend do not increase the put-away time and effort for the store employees.
- **1 Quadrant per Tote:** Each CVS DC and store is organized into quadrants. Each of the four sections contains products from similar product groups. We were required to keep these quadrants intact.

3.5 Segmentation

This thesis approaches picking improvement by proposing changes to the SKU slotting method through SKU segmentation. We do not measure affinity among products we propose a two-stage ABC classification as outlined below:

- **Stage 1:** Conduct Initial ABC segmentation on Section 2E. This allowed us to categorize the Fast, Medium-slow and Slow movers product groups based on the most recent data.

Because the DC structure does not change seasonally we decided against factoring in seasonality. We chose instead to take the sum of the orders for each product and divide by the number of weeks to get an average number of orders per week. The results from this section allowed us to determine the medium-slow, and slowest product categories.

- **Stage 2:** We then conducted an additional ABC segmentation on the medium slow and slowest movers from stage 1 respectively. Following the same method as in Stage 1, we identified and categorized the fast, medium-slow, and slowest movers within the medium slow and slowest movers.

3.6 Slotting

We assigned SKUs slotting as per graph 1. The line is divided into three sections: Fast Movers, Medium-slow Movers and Slow Movers derived from 1st stage segmentation. Each slot consists of 4 levels and therefore is able to contain 4 SKUs. The fast movers are slotted first as per Family Groups and then as per moving speed. Namely, the Family Groups with relatively fast-moving speeds are slotted in the front; the SKUs within the same family group with relatively fast-moving speeds are slotted in the front within the slot designated for the family group. The medium-slow and slow movers are slotted solely based on moving speed. SKUs belonging to all family groups are mixed together; the SKUs with relatively fast-moving speed are slotted in the front.

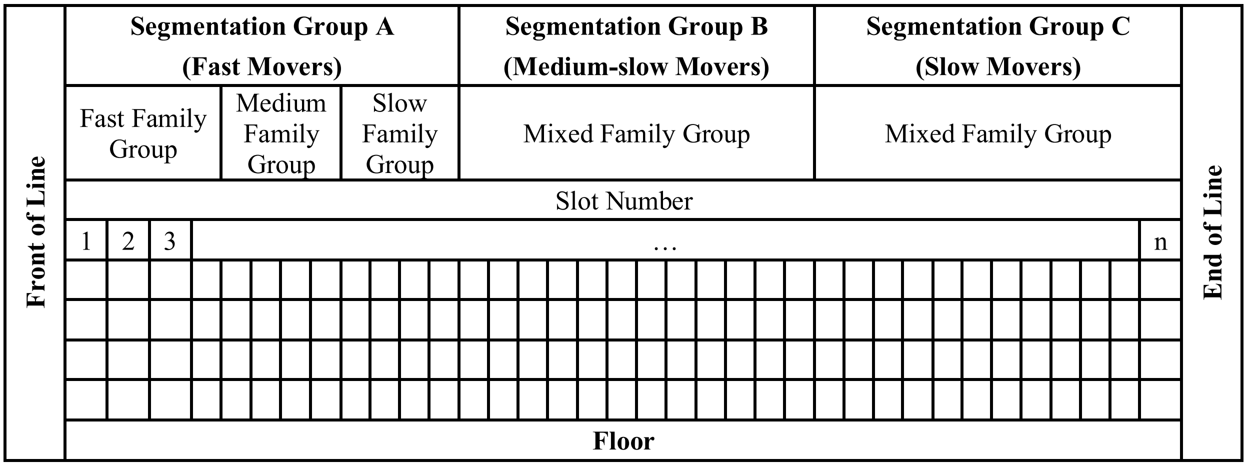

Figure 3:Example Line Slotting

3.7 Simulation

In order to understand the benefits of the new slotting we created a simulation to compare the distance travelled with the old layout and the new proposed layout.

3.7.1 Pick Lists

The Pick lists provided to us were generated by CVS's sophisticated Warehouse Management System and were optimized for efficiency based on their current layout. Therefore, it was necessary for us to generate our own pick lists to ensure the results would not be biased towards the old layout. We created fifty randomly generated pick lists based on the probability of products being selected. This probability as generated based on the frequency data provided by CVS. We also ensured the pick lists had a range of products to closely match the average number of products in the actual pick lists.

3.7.2 Assumptions

The simulation assumes all items take up the same amount of space on the racks. We had to build this assumption into the logic because we don't have the exact dimensions of the products. We also assumed that the products were being picked by one picker to make sure there was no double counting of the distance travelled.

3.7.3 Model

We created the simulation in Excel using the following data fields:

Table 3: Fields Used for Simulation

Field	**Description**
SKU_NBR	SKU Number
CATEGORYDESC	Product Categories: Adult Care, Books, Home Diagnostics, Personal Intimacy, Seasonal Wrap/Cards, Stationary
Weekly_Average	Average number of the item ordered each week.

We modeled the old layout as Model A and the new layout as Model B. The example of slotting chart is illustrated in Figure 3. We then took each pick list and found the distance travelled with the old layout as well as the new layout. The distance is defined as the number of slots between the furthest SKU and nearest SKU to the front. Taking the range of the distances for both layouts allowed us to compare the total distance travelled.

4. Results

4.1. Line Examination

Section 2E contains multiple family groups, with stationary making up the majority of the SKUs (see Table 4). We observed during the site visit that Section 2E moves slower than lines containing Health and Beauty SKUs. Our research starts with an examination of the relative moving speed of Section 2E in comparison to the entire SKU profile.

Table 4: Family Groups Summary for Section 2E

Family Group	**Count of SKU_NBR**
ADULT CARE	31
BOOKS	34
HOME DIAGNOSTICS	41
PERSONAL INTIMACY	2
SEASONAL WRAP/CARDS	6
STATIONERY	622
Grand Total	**736**

We first combined the SKUs from Section 2E with the SKUs from the other 2 lines visited to represent the SKU profile. Then ABC analysis was conducted following the 4 steps below.

- Step 1: We calculated the weekly order of each SKU by dividing the individual yearly order by the total number of weeks that incur orders.

- Step 2: We summed the individual weekly orders to get the total weekly orders. Then we calculated the relative order frequency by dividing the individual weekly order by the total weekly orders and ranked the SKUs by their relative order frequency.
- Step 3: We calculated cumulative order frequency by adding up the ranked relative order frequencies.
- Step 4: We classified the SKUs whose sum of weekly orders contribute to 70% of the total weekly order as Group A, between 70% to 90% as Group B and 90% to 100% as Group C.

Table 5 shows the segmentation results by ABC groups and by family groups. The entire SKU profile shows an ABC composition of 38% for A, 25% for B and 37% for C. Meanwhile Section 2E shows a composition of 13% for A, 31% for B and 56% for C. This indicates that the long tail effect is stronger in Section 2E than the entire profile. Section 2E accounts for 22% of SKUs in the profile. In terms of SKU count, section 2E accounts for 28% of group A, 18% of group B and 20% of group C. This proves that Section 2E does move slower than entire SKU profile.

Table 5: Segmentation on entire SKUs

Count of SKU_NBR

Family Group	A	B	C	Grand Total
ADULT CARE	4	3	24	31
BOOKS	1		33	34
HAIR CARE	288	343	696	1327
HOME DIAGNOSTICS	14	8	19	41
ORAL HYGIENE	397	186	155	738
PAIN RELIEVERS	215	140	147	502
PERSONAL INTIMACY	1		1	2
SEASONAL WRAP/CARDS		3	3	6
STATIONERY	327	132	163	622
Grand Total	**1247**	**815**	**1241**	**3303**

4.2. 1st Stage Segmentation

We conducted the ABC analysis on all SKUs in Section 2E and obtained segmentation results. Table 5 shows the number of SKUs in each family group under Group A, B and C. Table 6 shows the ABC composition under each family group. The vast majority of Section 2E is relatively slow moving. Out of 736 SKUs, fast movers (Group A) account for 13.18%, while medium-slow movers (Group B) account for 30.84% and slow movers (Group C) account for 55.98% (See Table 6). Table 7 shows the average weekly orders by family group under groups A, B and C. Within group A, Stationary moves the fastest among all family groups, with an average weekly order of 2,145. Stationary is followed by Adult Care, Personal Intimacy and Home Diagnostics (see Table 7).

Table 5: 1st Stage Segmentation Results

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**

Table 6: Breakdown of 1st stage Segmentation in percentage for Family Groups

Segmentation	ADULT CARE	BOOKS	HOME DIAGNOSTICS	PERSONAL INTIMACY	SEASONAL WRAP/CARDS	STATIONERY	Grand Total
A	3.23%		2.44%	50.00%		15.11%	**13.18%**
B	9.68%	2.94%	12.20%			35.05%	**30.84%**
C	87.10%	97.06%	85.37%	50.00%	100.00%	49.84%	**55.98%**
Grand Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**

Table 7: Average Weekly Orders by Family Group 1st stage Segmentation Groups

	Segmentation		
Family Group	A	B	C
ADULT CARE	628	281	22
BOOKS		442	29
HOME DIAGNOSTICS	574	219	36
PERSONAL INTIMACY	612		62
SEASONAL WRAP/CARDS			81
STATIONERY	2,145	258	83

4.2. 2nd Stage Segmentation

We separated Group B and Group C from the 1st stage segmentation and conducted the 2nd stage ABC analysis on that data. Within Group B, we labelled the fast movers, medium-slow movers and slow movers as Group BA, BB and BC respectively (See Table 11). Within Group C, we labelled the fast movers, medium-slow movers and slow movers as Group CA, CB and CC respectively (See Table 12).

Table 8: 2nd stage Segmentation on Group B

		Family Group			
Segme..		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

Table 9: 2nd stage Segmentation on Group C

		Family Group					
Segme..		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

4.3. Slotting

We created two slotting models, Model A and Model B. We based Model A on CVS's current slotting and model B on our 2-stage segmentation result. Within group A, there are only 3 SKUs not belonging to the Stationary family group, so we grouped them together with each other and put them into the same slot in Model B. Figure 4 shows how Line 2E would be laid out according to our Model B.

Front of Line	**Segmentation Group A (Fast Movers)**					**Segmentation Group B (Medium-slow Movers)**				**Segmentation Group C (Slow Movers)**				**End of Line**
	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	
Floor														

Figure 4: Sample Slotting for Model B

(Note: Model A is CVS original slotting scheme)

Table 10 compares the sample slot assignments for the first four slots of Model B.

Table 10: Sample of Slot Assignment in Model A & B

SKU No.	Slot Number	
	Model B	Model A
843837	1	175
799520	1	171
407683	1	151
887992	1	68
871509	2	99
206417	2	4
610709	2	152
848686	2	156

SKU No.	Slot Number	
	Model B	Model A
314257	3	82
256813	3	155
268614	3	131
327072	3	50
193920	4	56
167445	4	42
153940	4	55
316695	4	19

4.4. Simulation

We randomly generated 50 pick lists each containing 8-12 picking items. Table 11 shows 2 of the pick lists generated.

Table 11: Sample of Randomly Generated Picklists

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

Pick List No.6	
SKU No.	Weekly Average
977668	229
407683	612
327072	3309
828181	572
407683	612
990429	235
967098	199
407683	612

Using the 50 pick lists, we ran the simulation on slotting models A and B and calculated the difference in the distance between the two models. Table 15 shows a comparison of pick lists No.2 and No.6 as an example.

Table 12: Model Comparison

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			

Pick List No.6				
	Model A		Model B	
Picking Sequence	SKU No.	Slot No.	SKU No.	Slot No.
1	967098	1	407683	1
2	990429	14	407683	1
3	828181	31	407683	1
4	977668	34	327072	3
5	327072	50	828181	19
6	843189	52	990429	54
7	407683	151	977668	55
8	407683	151	967098	69
Travel Interval	150		68	
Saving	82			

We can roughly convert the slot distance saved to feet saved as shown below.

Total Length of the Line 2E	200 feet
Total Number of SKUs	737
Number of SKUs per Slot	4
Number of Slots	184
The Average Distance per Slot	1.086
Example Pick List 2 Feet Saving	57.61 feet
Example Pick List 6 Feet Saving	89.13 feet

Figure 5 displays the saving in terms of distance travelled for all 50 pick lists generated.

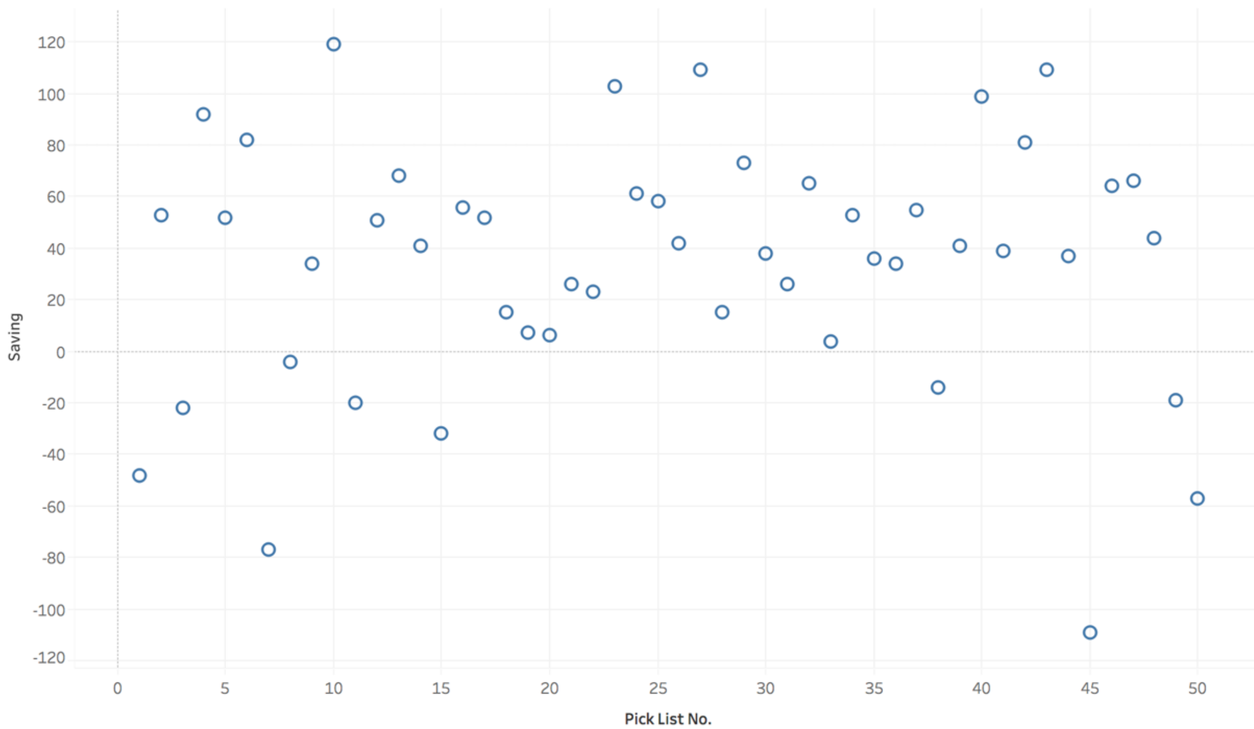

Figure 5: Savings for 50 pick lists

Table 15 shows the average, median and standard deviation of the savings. Positive savings are generated for 72% of the pick lists. Compared to Model A, Model B generates an average distance saving of 27.62%. On average, Model B saves 34.54 slots per picklist, which roughly converts to 37.51 feet per picklist.

Table 13: Saving Statistics

	MODEL B	MODEL A	SAVING	SAVING %
MEDIAN	92.00	132.50	41.00	30.94%
TOTAL	4525.00	6252.00	1727.00	27.62%
AVERAGE	90.50	125.04	34.54	27.62%
STANDARD DEVIATION	39.00	30.92		

5. Recommendations

We recommend that CVS break product categories to improve pick efficiency. Our two-stage ABC segmentation yielded seven different moving speeds based on frequency and each moving speed has various product categories represented as seen in Table 14 below.

Table 14: Product Categories

Moving Speed	Description	Categories represented
A	Fastest	Adult care, Home Diagnostics, Stationary, Personal Intimacy
BA	Medium Fast	Adult care, Home Diagnostics, Stationary, Books
BB	Medium	Home Diagnostics, Stationary
BC	Medium Slow	Home Diagnostics, Stationary
CA	Slow	Adult care, Home Diagnostics, Stationary, Seasonal Wraps/Cards
CB	Slow	Adult care, Home Diagnostics, Stationary, Personal Intimacy, Seasonal Wraps/Cards, Books
CC	Slowest	Adult care, Home Diagnostics, Stationary, Seasonal Wraps/Cards, Books

We recommend applying the double segmentation method to all SKUs to improve the slotting and decrease the travel distance for the pickers. We also recommend gathering more data on the product sizes to further optimize the slotting and get an even more accurate representation of distance travelled for picks.

6. Conclusion

The main objective of our project was to improve the CVS DC's merchandise slotting and assignment planning to optimize space utilization and decrease labor costs. This Capstone utilizes the double segmentation method to reduce the distance and time spent on piece picking activities. We approached this project by conducting a site visit to the CVS DC, collecting relevant data and maintaining constant communication with the CVS project lead.

We divided the project into three distinct parts:

- **Segmentation**: We conducted a double stage segmentation to divide the SKUs into seven categories based on their order frequency as described in Table 14 above.
- **Slotting**: We created a new slotting method to model how the SKUs should be organized in the slots.
- **Simulation**: We generated 50 pick lists and compared the new slotting to CVS's original slotting to understand the savings in terms of time and distance.

The project resulted in average distance saving of 27.62%, which roughly converts to 37.51 feet of savings per picklist. Future improvement could be made by including the travel distance between consecutive pick lists and by analyzing the effect of the size variation of pick lists on distance saving. CVS can further analyze the results to understand the savings in terms of costs and labour. Given the very high cost of capital expenditure on automation it is important for CVS to consider the alternative time saving methods generated in this project.

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