WORKFORCE EFFICIENCY INCREASE FOR THE ONLINE SALES IN-STORE PICKING OPERATION

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Abstract: The online food retailing got more attention to itself with the global coronavirus outbreak. Online marketing growth rate reached above 40% in the lockdown months. It became more important to deliver the orders faster than opponents. This study examines one of the biggest food retails company's in-store picking operation for workforce efficiency increase. The picker job description and daily work routines observed through observation forms. The results are validated by data extracted from the Collectify system, which is used for picking operation and has all the time stamp of picker's action. Analyzing data and combining with the output of observation forms, the new picking model proposed for the fresh departments (meat, deli, fruit & vegetable) products. Having two weeks of trial and after realizing the results with the Collectify system data, the new model helped operating costs decrease by 7,7% in the picking operation.

Keywords: Picking Operation, E-Commerce, Online Grocery, Workforce, Efficiency.
JEL: J2, J20, J21, J22, J23.

Introduction

The online marketing is a rising star in most of the businesses nowadays. In Turkey, online retailing revenues grew 339% from 2015 to 2019 with the average grow speed of 35% (Deloitte, 2019). In 2015 online sales was only 2.9% of the total retail revenue whereas in 2019 it became 6,2% of the total revenue (Deloitte, 2019). In the developed countries, the ratio is 12.3%, and in developing countries, it is 6.7% (Deloitte, 2019). As the world was hit by corona virus in early 2020, the importance of having online marketing became a necessity for the grocery retailers. Online grocery grew 22% in 2019, however with the unexpected pandemic crisis having globally 30% of new customers in the online market helped online grocery sales growth rate become 40% in the pandemic months. (Digital commerce 360, 2020)

Many online grocery retailers had a hard time due to over demand according to the capacity. Globally, panic buying caused shoppers to buy the items in bulks or buy the items they may not need at that moment. Due to uncertainty and the irrelevant shopper buying behavior, brick and mortar retailers had empty shelves and online retailers had orders ahead of 2 or 3 days because of overcapacity especially in the lockdown's days. (Bülent Dal, 2020)

Therefore, many companies reviewed their way of running the business in terms of picking operations, stock management and distribution channels to be

prepared for the possibility of having the second wave of pandemic and to have a better service quality from the customers' perspective.

In the online retailing "delivery time" has been defined as an important key performance indicator at the early stage of e-commerce marketing (Keeney Ralph L, 1999). Focusing on "having minimum time to reach a product" is a key objective to become a successful player in the market. (Swaminathan et al, 2003) and "perfect order rate" (delivering the order without any missing or damaged products) is also the key success factor in the operation. Hence, to have a successful ratio for customer satisfaction, a company must have good results on both key performance indicators. Reaching for higher results, companies should focus on last-mile operation and product picking operation.

The thesis of the study is to find a fast applicable and cheap improvement opportunity for the in-store picking operation of one of the biggest grocery retail company (Company X) through the process observation form and create a data analysis to achieve faster picking operation.

To accomplish such a purpose, the following tasks are formulated:

First, daily routines of in-store picking operation will be examined and work structures will be identified for the job of pickers. After understanding the way of operation routines, job details and responsibilities in the organization, the picking progress will be examined via process observation forms.

Second, the data from a system called "Collectify", which contains all the transactions and time stamps of pickers' action during the day, will be analyzed.

Third, understanding the daily routines of the in-store picking operation and combining it with the Collectify's data will help propose a new approach. Afterwards, new approach results will be compared to old methods to prove the benefit of change.

The objective of the study is to find an opportunity to decrease pickers' "average order picking time" (average time to collect all the products from an order) by seeking easy, fast and cheap implementation solutions, which will result in lower operating costs.

1. The Picking Operation

The Company X has an online operation in all cities in Turkey with more than 800 stores with around 3.000 employees. The online operation has about 6.7% of the total revenue of the company. The online operation is running in the stores based on the stores' product portfolio. Basically, each picker is operating as a customer in the store. In the operation, there are 3 different jobs, which are "Online Sales Representatives", "Pickers" and the "Delivery Employees".

In the store life, offline and online operations are run by different management teams and there is no transition between them. (Although in the

pandemic months offline employees helped pick products for the online operation, and from the management point of view it is operated separately)
Job Descriptions:

Online Sales Representatives (an employee's responsibilities):
- are responsible for the overall online operations;
- are responsible for how much capacity can the employees handle for a day thus planning shifts schedules on a weekly basis;
- are responsible for customer relationship and customer complaints;
- keep track of out of stocks products and report to the management.

Pickers:
- are responsible for picking up and scanning the products for an order which is assigned to the employee's tablet (Collectify system);
- inform online sales representatives about stock-out products;
- are responsible for calling customer for an alternative product if there is out of stock products in the order;
- are responsible for bagging cold chain products in blue bags;
- add customers' name stickers to each bag to prevent any confusion in the delivery process;
- are responsible for bagging food products (such as bakery, rice, chocolate etc.) separately, and cleaning products (such as detergent, non-food products, diapers etc.)

Delivery Employees:
- deliver the right order to the right customer in the given time;
- inform the customer if there might be a delay in the delivery;

2. Observation Form and Results

Analyzing job responsibilities and getting feedback from employee operations and store management, the "Observation Form" is designed to understand the daily routines of the pickers.
Sub-work structures are as follows:

(SPP) Starting Picking Process: Accepting orders from the tablet and looking at the order;

(W) Walk: Walking to the next product to pick it up or going for the next task;

(PP) Product Picking: Picking products from the shelves or fresh service section and putting products in the bags, (cold chain products in blue bags, and other products in orange bags)

(CC) Customer Communication: Calling customer for alternative products in case of stock-outs;

(LB) Labelling the Bags: Adding customers' name stickers to the bags;

(EPP) Ending Picking Process: After having all the required products, putting the bags in the delivery area;

(IT) Idle Time: Being idle during the progress;

(BT) Business Talk: Talking with management or colleagues;

(O) Others: Not defined actions;

In the picking progress, according to getting the products from the shelves or the fresh departments, there are mainly three different procedures. First, getting the products from the shelves, which are labelled as "other" in the product category in the observation form. These are basically packaged, or no process needed products such as tea, chips, drinks, packaged cheese etc. Second, getting a product from the meat or delicatessen service section the picker telling a butcher or a delicatessen employee about the product, then waiting for the preparation. This is labelled as "meat" or "delicatessen" in the observation form. Third, getting the fruit and vegetable products the picker choosing and weighing the product according to the order amount, then bagging it. This is labelled as "F&V" (fruit and vegetable) in the observation form.

Table 1
An example of Observation Form for Picking Progress

Observation Form for Picking Operation											
Date										11.07.2020	
Store Name										Akbatı Hypermarket	
Order No										65929***	
	Sub Work Structure										Time (Second)	Starting Time
0	SPP	W	PP	CC	LB	EPP	IT	BT	O	Product Category	minutes	08:23:27
1	X										6	08:23:33
2		X									58	08:24:31
3			X							Other	8	08:24:39
4		X									36	08:25:15
5			X							Other	5	08:25:20
6		X									43	08:26:03
7			X							F & V	62	08:27:05
8		X									7	08:27:12
9			X							F & V	77	08:28:29
10		X									15	08:28:44
11							X				142	08:31:06
12			X							Meat	13	08:31:19
13		X									47	08:32:06
14					X						23	08:32:29
15						X					42	08:33:11

Note: See the notation of the abbreviated names introduced in the preceding paragraph.

The observation form is used for 13 different online orders to understand the daily routine of a picker.

Table 2

The Total Time of Sub Work Structures and Number of Products

Order No	Sub Work Structure									Number of Products				
	SPP	WP	PP	CC	LB	EPP	IT	BT	Time	Total	Meat	Fruit&Vegetable	Delicatessen	Other
1	00:12	07:18	03:32		01:23	01:48	03:25		17:38:00	13	2	2		9
2	00:16	08:13	01:26		00:58	00:57			11:50:00	10				10
3	00:08	11:02	05:23	01:02	02:04	02:23	04:45		26:47:00	19	3	4	2	10
4	00:14	05:01	01:12		01:02	01:32	01:33		10:34:00	9			3	6
5	00:12	04:12	02:13		00:36	00:56			8:09:00	24				24
6	00:13	08:22	03:13		01:56	01:46	03:14	00:32	19:16:00	15	2	1	1	11
7	00:07	11:54	03:48		01:12	01:41		00:11	18:53:00	17		2		15
8	00:13	13:58	05:12		01:18	02:24			23:05:00	23		1		22
9	00:16	08:14	03:12		00:52	01:14			13:48:00	12				12
10	00:14	10:14	03:18		01:47	02:34	03:12		21:19:00	18	3			15
11	00:09	07:32	02:55		01:38	01:12	01:45		15:11:00	14			2	12
12	00:11	06:13	02:13		00:38	01:12			10:27:00	8				8
13	00:07	16:12	09:12	01:29	03:13	03:51	06:12		40:16:00	36	2	5	3	26

Note: See the notation of the abbreviated names introduced in the preceding paragraph.

Table 3

Percentage of Work Structures from 13 Different Observation Forms In July of 2020
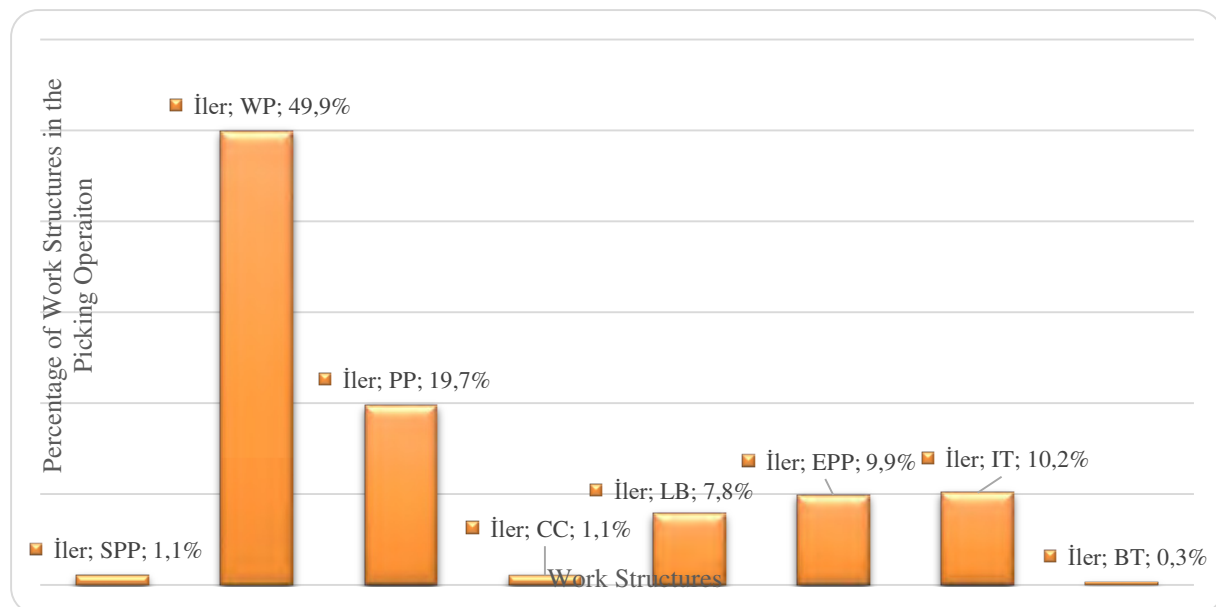
Note: See the notation of the abbreviated names introduced in the preceding paragraph.

Results from the observation form;

The pickers spend 49.9% of their time on walking from one shelf to another shelf or going to the delivery area.

Second higher ratio is "Product Picking," where pickers spend most of the time with the fruit and vegetable products. Comparing the order time, the orders with the Fruit and vegetable products have more "PP" time according to the other orders. This is mostly because pickers must weigh the products and if there is a

difference, s/he should rearrange the amount. This operation sometimes can be repeated twice or more. The other reason is not knowing the product well and the need for a fruit and vegetable employee to find the right product. They usually need a guide for products like green garlic and scallions, when the picker cannot tell the difference. There is also another bagging procedure, which increases the PP time as well.

The third higher ratio is on idle time. Most of the idle time is occurred in the either meat or delicatessen service section because the picker gives an order to the butcher or deli employee for required products and must wait until the process is finished. Sometimes a butcher or deli employee may prioritize the customer, which also makes the picker wait. Some of the meat or delicatessen products require cold chain, the picking algorithm making sure that pickers have collected these products at the last stage of the picking progress. Therefore, there is a small chance for pickers to pick another product while the meat or deli products are being prepared.

Ending the Picking Process has 9.9% of the total time. This amount is increases in the orders if there are products from fresh departments. The pickers should put fresh products in the cold cabinets to prevent any break in the cold chain during the progress. Hence these cabinets are placed separately from the normal products' cabinets, as there must be extra time to do the progress.

Labelling bag work structure has 7.8% of the total time. The amount increases if there are more and various products.

The observation form helps to understand where pickers spend most of the time, the shortages and time waste in the progress. As a result, there are improvement areas in the products picking progress from the fresh departments. Normally, it takes between 5- 9 second to take the other type of product from the shelf and put in a bag, however in the fruit and vegetable department it takes much longer and sometimes it requires experience to know the right product. On the other hand, the idle time in front of meat and delicatessen departments is waste of time in the progress. These are the results obtained from the observations, and before proposing a new model, these assumptions should be verified by data. Therefore, the Collectify system data results will be compared between orders with fresh products and orders with non-fresh products to clarify the time difference between them.

3. Collectify System and Results

The Collectify system has each products scan time, picking starting time and picking ending time stamps. Thus, Akbatı Hypermarket's online operation of 1-31 July 2020 collectifies the system data analyzed. In July, the operation had 11.824 orders with 169.728 sold products. 18,6% of the products were from the fruit and vegetable department, and 2,1% of the products (processed by the

employees) - from the delicatessen department; 3,2% of the products - from the meat department (processed by the butchers), and the rest 76,1% of the products were from the other departments. The average number of products per order is 14.4.

The orders with the number of products between 13 and 17 are picked to be analyzed to prevent any outliers. The 7.449 orders are divided in four different groups. The first is "Orders with Meat and Other Products", which has no deli or fruit and vegetable products in the orders and has total of 365 orders. The second is "Orders with Deli and Other Products", which has no meat of fruit and vegetable products in the orders, with the total of 609 orders. The third is "Orders with Fruit and Vegetable Products", which has no meat and deli products in orders and has total of 2.740 orders. The last one is "Orders without Fresh Products, which has no meat, deli and fruit and vegetable products in orders and has 1.928 orders.

Table 4
Average Picking Time for Orders with Meat Products for 1-31 July

Number of meat product in the orders	Number of Orders	Orders With Meat and Other Products Average Picking Time	Number of Orders	Order Without Fresh Products Average Picking Time	Time Difference	Difference per product
1	263	18:57	1928	16:55	02:02	02:02
2	66	20:38	1928	16:55	03:43	01:51
3	18	22:43	1928	16:55	05:48	01:56
					Average	01:59

Note: The orders with 4 or more meat products are not included in the table.

Table 5
Average Picking Time for Orders with Deli Products for 1-31 July

Number of Deli product in the order	Number of Orders	Orders With Deli and Other Products Average Picking Time	Number of Orders	Order Without Fresh Products Average Picking Time	Time Difference	Difference per product
1	359	17:54	1928	16:55	00:59	00:59
2	164	18:49	1928	16:55	01:54	00:57
3	18	20:26	1928	16:55	03:31	01:10
					Average	00:58

Note: The orders with 4 or more meat products are not included in the table.

The orders with 1, 2, and 3 meat products are analyzed and compared to the orders without fresh products. The result shows that pickers spend averagely 01:59 minutes more compared to the orders without fresh products. From the observation form outputs, the assumption can be made that 01:59 minutes are mostly spent on idle time waiting for the product preparation. This assumption is also valid for delicatessen section as well with the 00:58 minutes difference.

Table 6

Average Picking Time for Orders with Fruit and Vegetable Products for 1-31 July

Number of Fruit&Vegetable product in the order	Number of Orders	Orders With Fruit&Vegetable and Other Products Average Picking Time	Number of Orders	Order Without Fresh Products Average Picking Time	Time Difference	Difference per product
1	1178	18:07	1928	16:55	01:12	01:12
2	1096	19:23	1928	16:55	02:28	01:14
3	274	20:30	1928	16:55	03:35	01:11
					Average	01:12

Note: The orders with 4 or more meat products are not included in the table

With the fruit and vegetable products, there is averagely 01:12 more minutes needed in the picking progress. From the observation form, these time differences are mostly spent on products weigh and bagging progress.

The observation form and Collectify data analysis's outputs guide us to look for improvement in the product picking progress from the fresh departments.

4. The New Picking Model and Results

The observation form results have 10,1% idle time in the operation and comparing Collectify's system results between orders with fresh products and non-fresh products, it may vary from at least 00:58 seconds to 01:59 seconds per fresh product picking time. The "idle time" is a time period when an asset is ready and available, and it is not doing anything rather than waiting. This is the reason sometimes it is call waiting time (Christiansen, 2020). The progress of idle time may occur if the system has a bottleneck in the operation. "Bottlenecks are critical processes that influence the throughput of the all system. The larger the influence, the more significant is the bottleneck (C. Roser & M. Nakano)". Therefore, in-store picking operation should be examined with bottleneck approach to minimize the idle time.

In the meat and delicatessen departments the products must be processed by the butchers or delicatessen employees. From the online operation perspective, there is no room for the improvement in the process hence there are the idle employees, however the picker's idle time waiting for the products to be ready can be minimized. As mentioned before, online and offline operations are run by different management teams. Due to different management teams, it has been hard to implement solutions, which benefited one side in the last years. The pandemic proved that online and offline operations needed each other support to offer better customer satisfaction and have better sales growth rate. Thus, having meetings with both online and offline management teams, the new model has been decided and agreed. According to the new model, both butchers and delicatessen employees will have tablets in their service area, which has Collectify system and information on needed products per orders. The orders which have meat or deli

products will be prepared at least 2 hours before the delivery time and fresh department employees put the products in the designated cabinets in the departments. Thus, when the picker comes to pick it up, the product will be already ready and there will be no bottleneck in the fresh department operation and hence no idle time.

In the fruit and vegetable departments, there was 31.569 product sold in July 2020. As a result of Collectify data analysis, one fruit and vegetable product was collected for an average of 72 seconds more compared to other products. Therefore, to handle that many products, 3.2 Full-Time pickers are needed per day to cover the operation.

In July, daily 1.052 of fruit and vegetable products were sold. With 72 seconds average time, 21.04 hours were needed to picking operation. (1.052 product X 72 seconds / 60 for minutes / 60 for hours) = 21.04 hours.

Having one employee working for 7.5 hours a day, then 21/7.5 = 2.8 full time is needed just only to pick up the fruit and vegetable products. This calculation does not include walking time from shelves to fruit and vegetable departments and it is made provided there are no interruptions. Due to store operations nature, sometimes different requirements and urgent needs may occur. Therefore, using 15% buffer time for these circumstances we can assume 2.8 FT *1.15= 3.2 full time pickers are needed.

In the customers' point of view, fresh products are always the key to having satisfaction. Therefore, preventing any confusion in the products and making sure that online customers get the best fruit and vegetable products, the picking progress for the department should be done by the fruit and vegetable employees and not by pickers, hence they are more experienced about the products. Thus, as a trial, 2 new fruit and vegetable employees were hired. The department has 7 employees with the 2 new ones. The department will have a tablet in their service area, which has Collectify system and information on needed products per orders. The picking progress should be done at least 2 hours before the delivery time and all fruit and vegetable employees should help for the online picking progress and they should put the products in the designated area in the department. Thus, having more experienced employee for the picking procedure and running operation in a much smaller area compared to all store drove us to hire 2 new employees instead of 3.2 full-time ones.

As a result, the meat, delicatessen, and fruit and vegetable products will be ready in the fresh departments when the pickers come to pick it up. Based on the new model requirements, the Collectify system has been changed by the IT department. After conceptual realization of the new model and system development finalized, two weeks of trial ran in the period of 17-30 August, 2020.

The Collectify system two weeks results are analyzed based on the same model calculations used in July data.

Table 7
Average Picking Time for Orders with Meat Products for 14-30 August

Number of meat product in the orders	Number of Orders	Orders With Meat and Other Products Average Picking Time	Number of Orders	Order Without Fresh Products Average Picking Time	Time Difference	Difference per product
1	145	16:58	1066	16:48	00:10	00:10
2	36	17:07	1066	16:48	00:19	00:09
3	10	17:16	1066	16:48	00:28	00:09
					Average	00:09

Note: The orders with 4 or more meat products are not included in the table

Table 8
Average Picking Time for Orders with Deli Products for 14-30 August

Number of Deli product in the order	Number of Orders	Orders With Deli and Other Products Average Picking Time	Number of Orders	Order Without Fresh Products Average Picking Time	Time Difference	Difference per product
1	199	16:54	1066	16:48	00:06	00:06
2	91	17:03	1066	16:48	00:15	00:07
3	10	17:11	1066	16:48	00:23	00:07
					Average	00:07

Note: The orders with 4 or more meat products are not included in the table

Table 9
Average Picking Time for Orders with Fruit and Vegetable Products for 14-30 August

Number of Fruit&Vegetable product in the order	Number of Orders	Orders With Fruit&Vegetable and Other Products Average Picking Time	Number of Orders	Order Without Fresh Products Average Picking Time	Time Difference	Difference per product
1	652	16:56	1066	16:48	00:08	00:08
2	606	17:05	1066	16:48	00:17	00:08
3	152	17:12	1066	16:48	00:24	00:08
					Average	00:08

Note: The orders with 4 or more meat products are not included in the table

As a result, meat products average picking time decreased from 01:56 minutes to 00:09 minutes with the 92% decrease of total time. The delicatessen products average picking time decreased from 01:06 to 00:07 minutes with the 89% decrease of total time. The fruit and vegetable products average picking time decreased from 01:12 to 00:08 minutes with the 88% decrease of total time.

5. Conclusion

The new model decreased fresh department per product picking time more than 89% in all three departments.

Table 10
New Model Results

Departments	1-31 July	14- 30 August	Decreased Time per Product	Decreased Percentage
Meat	0:01:56	0:00:09	0:01:47	92%
Deli	0:01:06	0:00:07	0:00:59	89%
Fruit and Vegetable	0:01:12	0:00:08	0:01:04	89%

In the second half of August, 1.782 of Deli products, 2.716 of meat products, and 15.795 of fruit and vegetable products were sold. Multiplying by the decreased time on a daily basis, 27:54 minutes has been saved by the new model.

Table 11
New Model Daily Saving Time

Department	Number of Product Sold in 14-30 August	Decreased Time	Total Saved Time in 2 weeks	Daily Saved Time (Hours)
Meat	2.716	0:01:47	80:43:00	5:45:56
Deli	1.782	0:00:59	29:12:00	2:05:09
Fruit and Vegetable	15.795	0:01:04	280:48:00	20:03:26
			Total	27:54:30

However, in the fruit and vegetable department there are two new employees, therefore their total daily working hours, (weekly working hours 45:00 X 2 employee / 7 days) 12:51 hours should be subtracted from the total. As a result, the new model has saved 15:03 hours per day, which is equal to 2 full time employees (7,5 daily working hours). Akbatı Hypermarket has 26 employees working in the online operation for picking operations only. The model suggested 2 less employee for the total operation. In the end, there is 7,7% (2/26) employee cost saved in the online operation.

The project proves that offline and online operations together with a shared purpose give a company operating leverage in terms of better employee cost ratio. In the company, there are 263 stores having total of employees from 8 to 72 in a store with the total of 4.273 employees. This model will be implemented to the all stores in the 6 months period based on the technical system development and hardware purchase on store based. Although each store may have different ratio of sold fresh products compared to all products, to get an insight in the Akbatı Hypermarket saving ratio used, the company has a potential of saving 329 (%7,7) employee cost in total.

For further study, product picking algorithm, ending picking progress or labelling the bags can be evaluated to maximize the efficiency of workforce management.

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СТОПАНСКА АКАДЕМИЯ „Д. А. Ценов"

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