Improving the Warehouse Picking Operations at Arvato SCS

ABSTRACT

THE ORDER FULFILLMENT PROCESS

Warehouse and inventory management are some of the key and integral parts of any logistics system. Therefore, any disruption in warehousing can cause serious problems for the whole business. The aim of this project is to optimize picking operations for Arvato SCS, a third-party e-commerce supply chain operations firm located in Tuzla, Istanbul. The picking process is the most time-consuming and most costly operation which takes up to 55% percent of operating expenses in a warehouse and firms are always looking for ways to optimize this process. Operations at a warehouse could be divided into 5 main categories: Receiving, shelving, picking, packing, and shipping. The flowchart can be seen above in Figure 1.

We aimed to optimize the picking operations in Arvato Supply Chain Solutions Company warehouse by analyzing the picking process data and suggesting solutions to problems that can be improved efficiently and help to reduce time required for the operations. We used literature scanning, observing of existing processes and also experienced the operation in the warehouse, data analysis (by using such tools like Microsoft Excel, Python), and used regression techniques.

OBJECTIVES

We intended to spot the impurities and disruptions in the picking process of the Arvato warehouse by analyzing picking process data and suggesting solutions on how to smoothly conduct this process by overcoming those impurities.

PROJECT DETAILS

Table 1: Threshold levels and corresponding adjusted R^2 values

<table>
<thead>
<tr>
<th>Minutes Between 2 Picking Operations</th>
<th>Adjusted R^2 Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.6768</td>
</tr>
<tr>
<td>4</td>
<td>0.7413</td>
</tr>
<tr>
<td>5</td>
<td>0.6708</td>
</tr>
</tbody>
</table>

Table 2: Comparison of Adjusted R^2 values of regression with 2 different independent variables (quantity/location ratios)

Throughout the project, many tasks regarding data analysis has been performed, below there is a list and brief explanations of them:

- **Determination of the Threshold Level of time in-between 2 Picking Operations**
  In Table 1, there are 4 trials of the regression of one picking worker (username: burak) for a representation of the whole case. As the threshold level increases, the R2 of the regression between the time and distinct count of locations decreases, meaning that the relationship gets weaker. So, it is safe to say that a lower threshold level would be more preferable.

- **Regression Analysis with Distinct Count of Location Variable**
  In this regression analysis with the distinct count of location variables, our hypothesis is that with more and more distinct locations visited during a picking process, the total time of the picking process would increase. In order to observe the correctness of this hypothesis we performed a linear regression analysis.

CONCLUSIONS

- **Threshold level of time:** We found that a 3-minute threshold for uninterrupted picking operations were sufficient with minimal data loss when compared to a 4-minute threshold. This threshold level led to an increased R^2 value, which indicates that this is a better threshold level when compared to 4-minute threshold and 5-minute threshold.

- **Relationship between distinct count of locations and picking time:** Our analysis confirmed that there is a positive correlation between the number of visited locations and time spent during picking operations. The results indicated that higher work tempo and workload during peak periods resulted in increased picking time.

- **Quantity/Locatation ratio and problematic locations:** The inclusion of quantity/location ratio did not improve our regression model, and the presence of problematic locations had a negative correlation with picking time which is contrary to our initial hypothesis. Therefore, these variables are not included in the final analysis.

REFERENCES


