



Case Study

Data Analytics for Root Cause Analysis & Recommendation System in Order Picking Operation



Case Study Highlights

Domain

Warehouse Management

Challenges

- Order picking costs money and effort, up to 60% of labor and 55% costs within a warehouse.
- To optimize the order picking process, businesses need to first identify the problems before working on solutions.
- One global company came to FPT with the quest for efficiency in warehouse management via an optimized order picking process.

Solutions

The completion of the project means the successful resolution of the two following questions, both of which can be addressed by Exploratory Data Analysis:

- *What causes such inefficiency?*
- *What solution can the client adopt to reduce picking time?*

Results

- Picking route reduced by 48.3%
- Picking time reduced by 15%

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The painful process that is Order Picking

Order picking costs money and effort, up to 60% of labor and 55% costs within a warehouse.

To optimize the order picking process, businesses need to first identify the problems before working on solutions.

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Order picking has long been regarded as the bottleneck and the most labor-intensive operation in the entire warehouse management process. Studies have shown up to 60% of labor activities within a warehouse can contribute to order picking, resulting in order-pick taking up 55% overall warehouse operating cost (Ho, Su and Shi 2008; de Koster, Le-Duc, and Roodbergen 2007). In addition to cost-ineffectiveness, the usually time-consuming operation of order picking significantly impacts the entire cycle of order fulfillment. Warehouses' operational efficiency depends much on the efficiency of order-picking operations.

Before jumping into the process of “operational make-over”, businesses need to identify the exact problems of its existing order picking operation. Only by pinpointing the root causes of inefficiencies can appropriate methods be used to redesign processes effectively. The booming of data-driven technologies provides an automated mechanism where evaluating operational performance and identifying root causes of problems are streamlined and simplified, laying the foundation for reinventing order picking processes.



Recently, one of our clients came to us with the problem of how to pinpoint the issues in their warehouse operation. Their logistics business focuses on the movement of electric precision parts, OA machinery, telecommunication equipment, electronics, and machine parts. As with any other logistics service provider, their daily business operations entailed picking up different types of goods from different warehouses, and this activity usually took more time than they wanted. With it, efficiency was not realized. They came to FPT with such a business problem and an obsessive goal of reducing picking time.

A two-pronged Approach

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2. *What solution can the client adopt to reduce picking time?*

Root Cause Analysis

For the first question, data analysis and on-site observation were conducted to find out factors that might have impacted picking duration of each type of goods. A two-pronged approach was applied to compare and contrast findings between practical operations and historical datasets.

Approach 1

Practical Operations (Business Viewpoint)

Observation of practical operations showed several causal factors that may have contributed to slow order picking. These factors were then validated and cross-checked with data to shortlist down to only three aspects:

1. *Ineffective picking list*
2. *Picking Route Allocation*
3. *Items location*

Approach 2

Historical Data Analysis (Data Viewpoint)

At the same time, the data analyst team deep-dived into the customers' historical operational dataset to identify the phase during which more time was spent on the same quantity of goods by clustering goods picking history. The result from such analysis showed the two probable causes of:

1. *Picking staff's performance*
2. *Item's location*

The two methods overlapped in the factor of Items' locations where frequently picked items were placed far from traveling routes and scattered around the warehouse, leading to the increase in pick-up time as well as labor wastefulness.

The steps of the approaches can be outlined as follow (figure 1):

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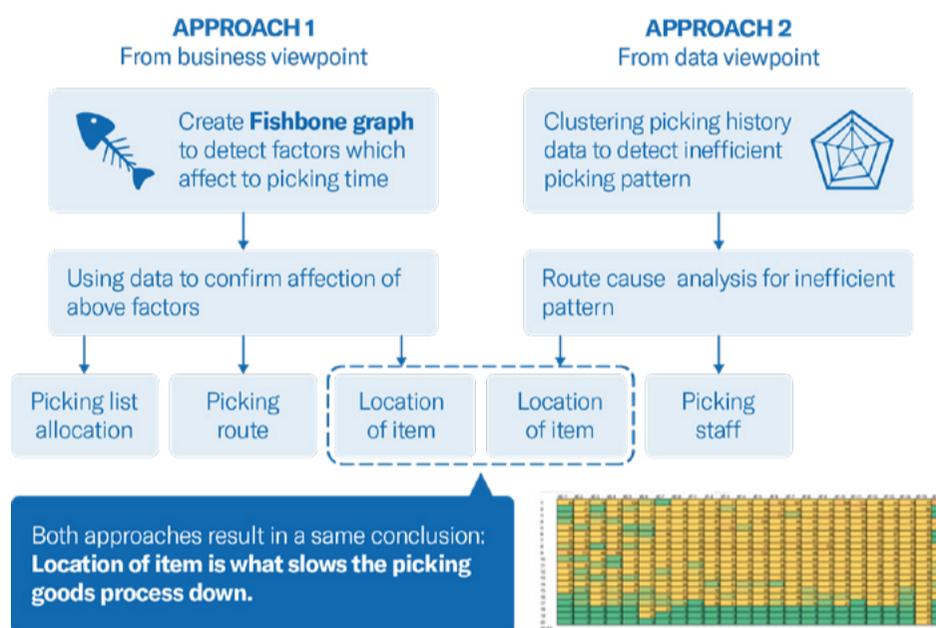


Figure 1: The two-pronged Approach

The Solution

Once the issue with item placement within the warehouse was identified as the core problem, an idea of a Recommendation System for Optimizing goods location was put forth as the most viable solution.

The system would enable a mechanism whereby:

1. Calculating the remaining space would be automated in each warehouse, based on data on item volume and shelves spacing.
2. Item placement would be optimized via the enablement of Data mining techniques:

Recommend frequently picked items to be placed closed to traveling routes.

Automatically run association analysis (apriori algorithm) to find items that are commonly selected together, therefore put them within the vicinity of one another.

Run Simulated Annealing algorithm to find the optimized location for each item.

Because the customer was running an existing warehouse management system, the recommendation system would be designed, developed, and then integrated into the current application infrastructure.

The Results

Picking route reduced by
48.3%

Picking time reduced by
15%



The first demo phase, from on-site measurement and data, showed that the **picking route decreased from 295,286.99m to 152,613.1m (~48.3%), reducing 15% picking time.** At the same time, spacing and storing were also optimized.

The new system has simplified the picking route by delivered real-time data and automated suggestions for staff. Also, enhancing stock control with a new systematic and fully utilized placing structure is another outcome reckoned.

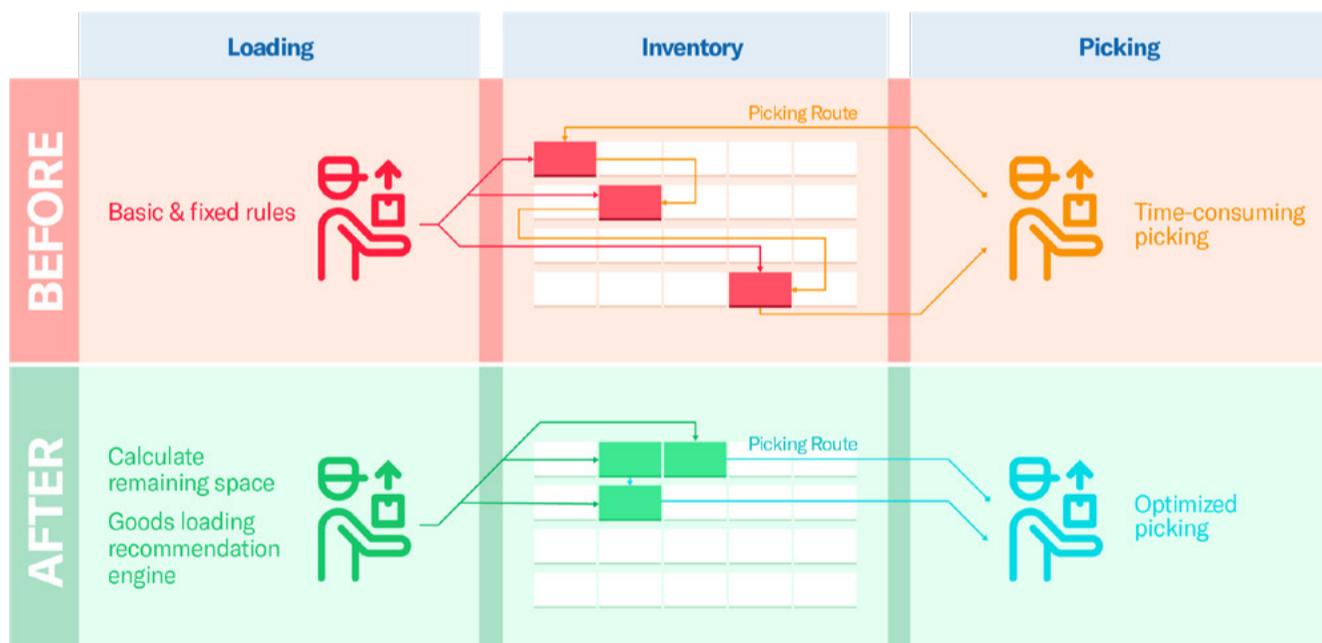


Figure 2: Results from the new placement system applied

Along with the outbound procedure upgrade, staff performance has been improved due to the increased productivity for one staff to pick up different items in a shorter period. As the backbone, the system is believed to streamline the inbound process as loading goods are likely to be more straightforward and trouble-free based on the placement suggestions and available shelves recorded.





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