

Reducing Manual Decisions in the Trailer-To-Door Allocation Process



Walmart Supply Chain - DC 6094
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Background

- To support over 5000 stores nationwide, Walmart's supply chain includes a large network of distribution centers.
- DC 6094, located in Bentonville, Arkansas, is one of 42 of Walmart's regional distribution centers (RDCs).
- RDCs primarily process and store general merchandise and dry grocery.
- Processing over 200 trailers each day, managers on the receiving docks currently manually decide which door to assign an incoming trailer.
- Industry research showed other companies use certain systems to assign incoming trailers to doors, but their systems were not suitable for the design of Walmart DCs.
- Academic literature led us to mathematical models modeling similar operations; however, none captured the complexity Walmart faces.



Figure 1. Inside a Walmart Regional Distribution Center.

System Process

- There are two different receiving docks a trailer can be placed on – staple stock (SS) and distribution assembly (DA).
- The staple stock dock is intended for receiving items which are stored in the warehouse due to their high sales velocity in stores.
- Item are stored in specific "slot" locations, divided into three different categories – food friendly, non-food friendly, and non-conveyable.
- In assigning trailers to the SS dock, managers should seek to place the trailer near the item's slot, to minimize hauling distance.

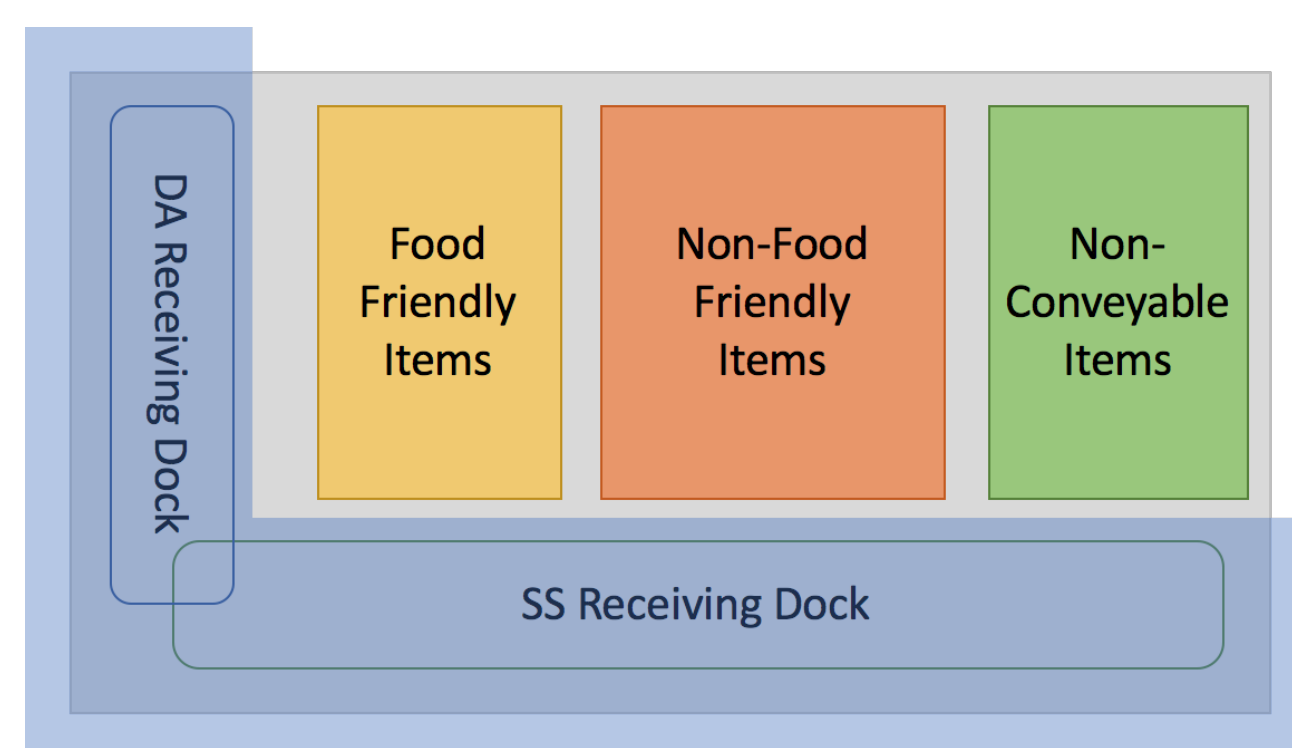


Figure 2. Visual Representation of the Layout of Both Docks and SS Categories

- The DA dock receives seasonal items, or items with lower sales velocity.
- All items received on this dock will go straight to shipping via conveyor.
- There are three methods for receiving on the DA dock – with a normal dock door, an automated case labeler (ACL), or an extendable conveyor.
- In assigning trailers to the DA dock, the most important thing to consider is best utilizing the equipment available.

Figure 3. (left to right) A Normal Dock Door, an ACL, and an Extendable Conveyor



Decision Support

- An automated system (Autodock) currently exists to automatically assign trailers to doors; however, due to gaps in logic and change management issues, it is not being used across the network.
- With visits to DC 6094 and discussions with receiving managers, we learned the process and identified rules and constraints to design a decision support tool.

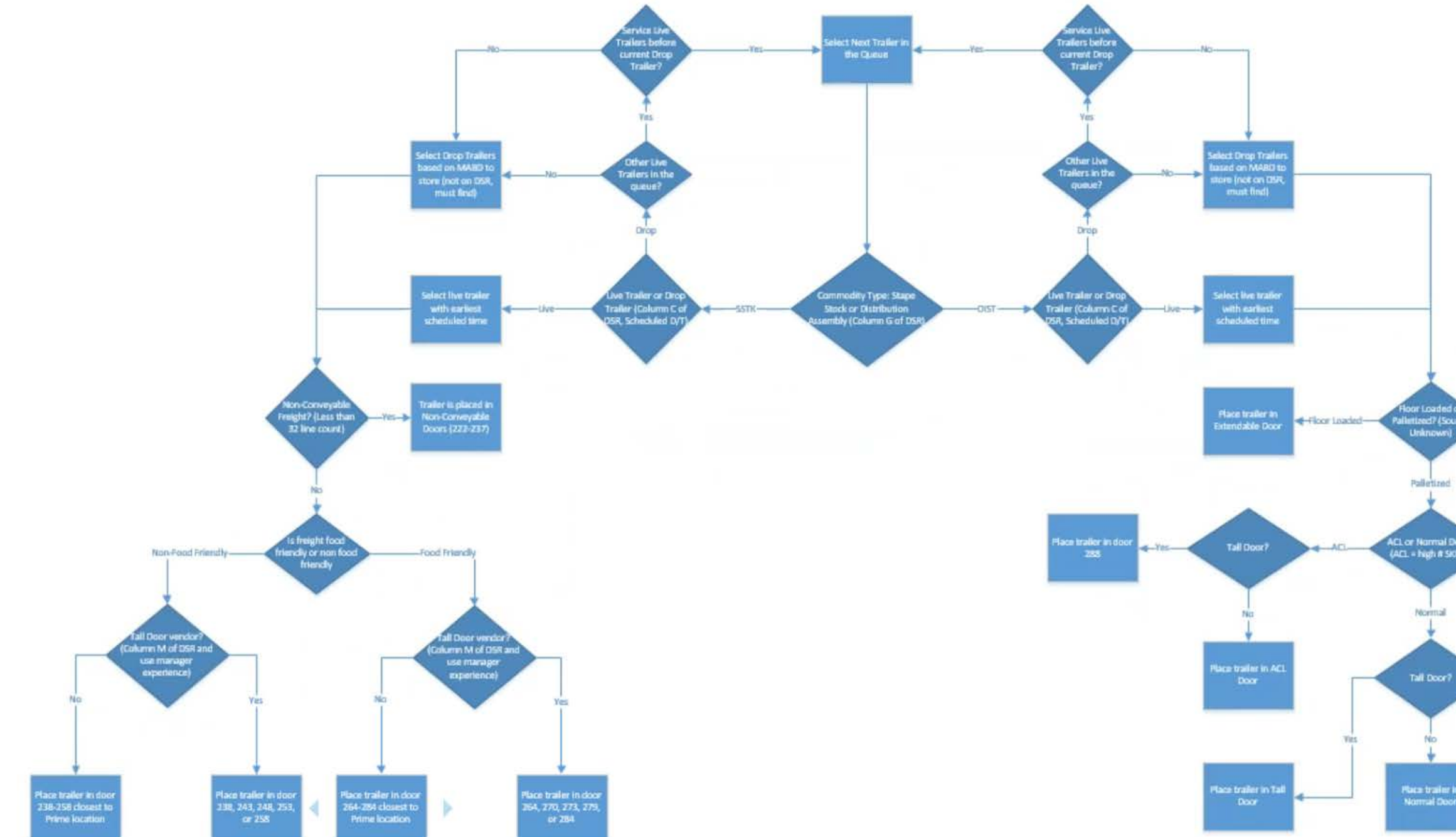


Figure 4. Tool Logic Flow Chart

- We created a decision support tool to help receiving managers make decisions on where to place a trailer on the receiving dock.
- Microsoft Excel is the platform for our decision support tool.
- The "Welcome" Tab (Figure 5) provides the user with brief instructions on running the tool, and includes a user tab breakdown.

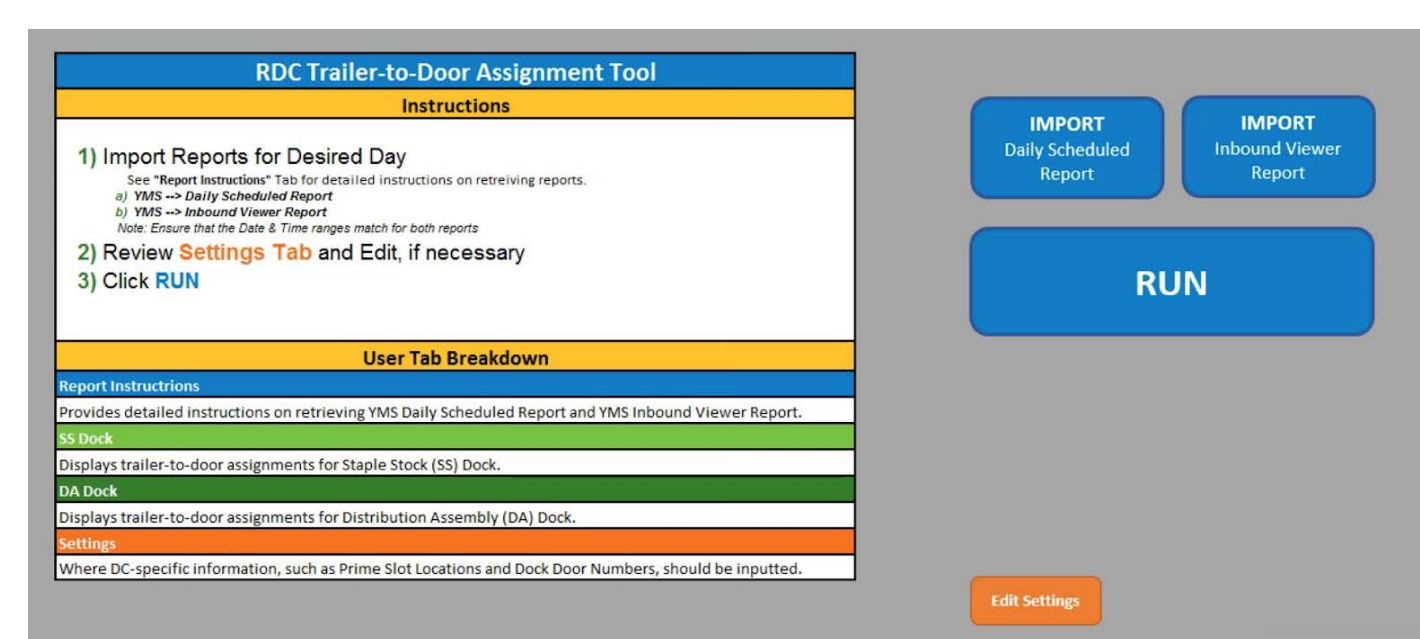


Figure 5. The "Welcome" Tab



Figure 6. The "DA Dock" Tab

- After the import of two reports, and once the user has clicked "RUN", two tabs will populate, one for each receiving dock.
- Each dock view tab will display five trailers to be processed, three door recommendations for each trailer, and a visual showing the state of the dock.

SS Door Recommendations

Tool identifies, out of the doors available, which doors have the shortest distances to the vendor's storage module.

DA Door Recommendations

Tool evaluates trailer case count and line count to suggest doors with most appropriate mechanism for receiving.

- A user selects a door for a trailer by clicking the corresponding "Assign" button. The sheet will refresh accordingly (updated trailer list and visual).
- There exists an option to input a different door, outside of the three recommended, if necessary.
- Once a trailer is finished being serviced, there is a button called "Release Door" to notify the tool that door has become available again.

Business Case

- There is a strong business case for Walmart to implement a decision support tool for the trailer to door allocation process.
- It will benefit:

Associates
 Unloaders will spend more time with managers, reducing turnover and increasing productivity.

Receiving Managers
 Managers will spend less time at the desk and more time on the floor, and make fewer and smarter decisions.

DC Flow
 The tool will make better use of DC unloading technology, improving overall productivity and flow.

New Managers
 Newer managers will benefit from a smaller learning curve, which reduces the cost of training and improves impact.

Cost Analysis

- Historical data on door assignments in the staple stock dock was collected.
- The hauling distance between the door and assigned module was measured.
- The data was then used as an input for our support tool to compare results.
- A Two Sample T-Test was performed which showed the support tool produced door assignments with significantly lower hauling distances.

| Two-Sample T-Test and CI: DC 6094, Support Tool | | | | |
|--|----------------|---------|--------|----|
| Method | | | | |
| μ: mean of DC 6094 | | | | |
| μ': mean of Support Tool | | | | |
| Difference = μ - μ' | | | | |
| Equal variances are not assumed for this analysis. | | | | |
| Descriptive Statistics | | | | |
| Sample | N | Mean | StdDev | SE |
| DC 6094 | 69 | 382 | 251 | 30 |
| Support Tool | 69 | 209 | 171 | 21 |
| Estimation for Difference | | | | |
| 95% Lower Bound for Difference | | | | |
| Difference | 173.3 | | | |
| Test | | | | |
| Null hypothesis | H0: μ - μ' = 0 | | | |
| Alternative hypothesis | Ha: μ - μ' > 0 | | | |
| T-Value | DF | P-Value | | |
| 4.75 | 119 | 0.000 | | |

Figure 7. Results of Two Sample T-Test Comparing DC 6094 to Simulated Hauling Distance

• We translated a hauling distance reduction of 173 feet into labor savings.

173 ft saved per trip * 12 trips per trailer =

1029 feet per trailer reduced

1029 ft saved per trailer / 8mph PE =

.049 hrs saved per trailer

.049 hrs * 100 trailers per day * 365 days per year =

1796.67 hrs saved per year

1796.67 hrs saved per year * cost of labor =

\$34,136 yearly savings

Network Wide Savings: \$1,775,112