Multi-Channel Retailing: Upgrading Your Order Fulfillment Systems

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OFS
OrderFulfillmentSolutions.org

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The Main Challenge in Multi-Channel Distribution

Order Profiles: A collection of attributes associated to an order that describes how the order is composed and what fulfillment needs it requires.

The constraints imposed by poorly designed software and rigidly designed storage material handling devices exacerbate the issue to process varied order profiles.

↑ Cost/Unit Shipped ↓ Throughput ↓ Capacity

Composition

- Number of Lines
- Number of Units
- Velocity Mix of Items
- Affinities of Items

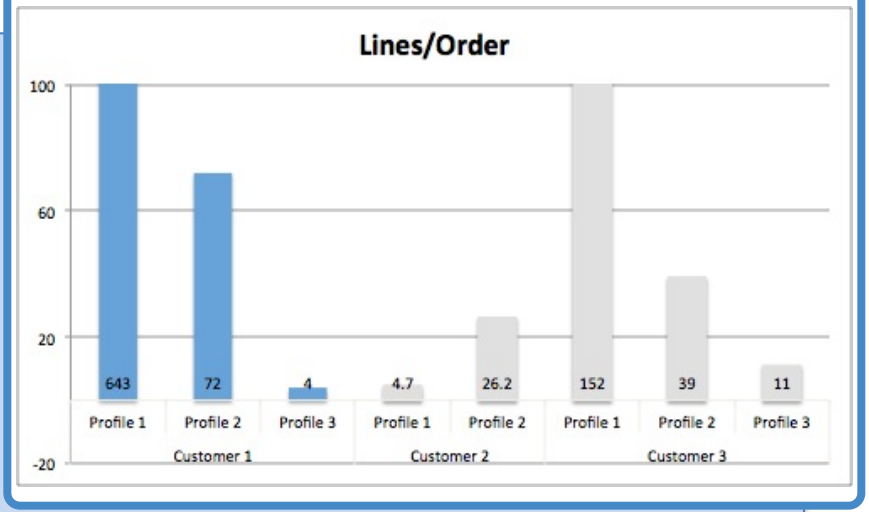
Fulfillment Requirements

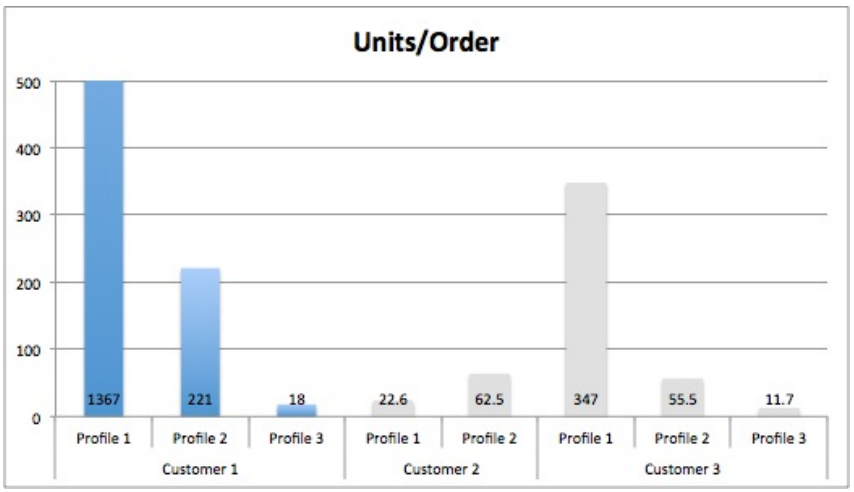
- Dispatch Times
- QC Thresholds
- Value-Added Services
- HAZMAT

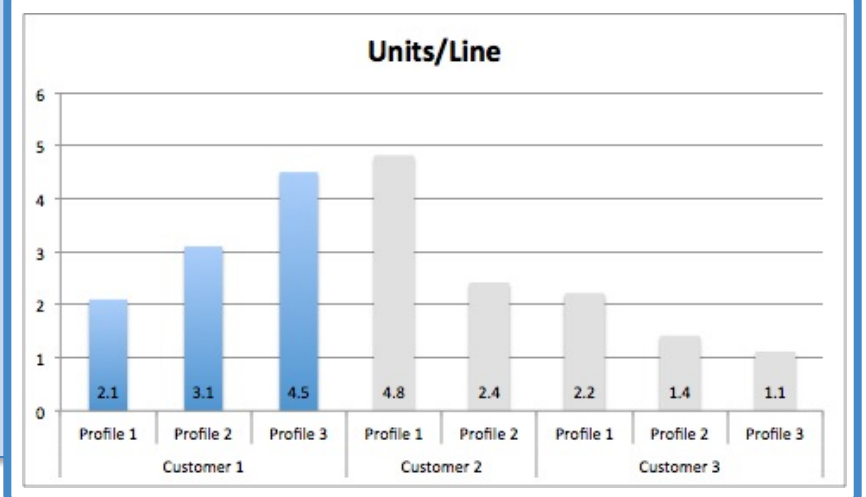
Order Profiles Through Data Models

Customer 1

- Consumer Electronics
- $ 6 Billion Revenue
- Stores, Kiosks
- Order Profiles
  - Brick and Mortar Store Replenishment
  - Mobile Stores
  - Kiosk/Express Stores



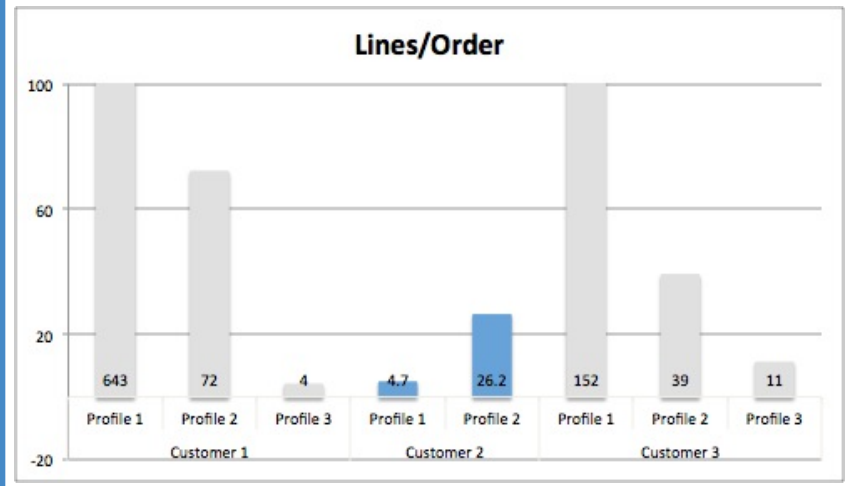


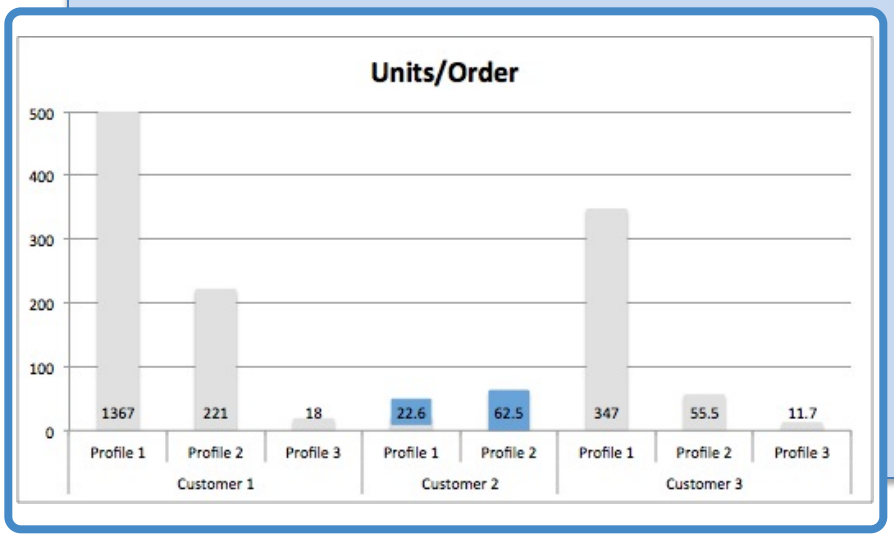


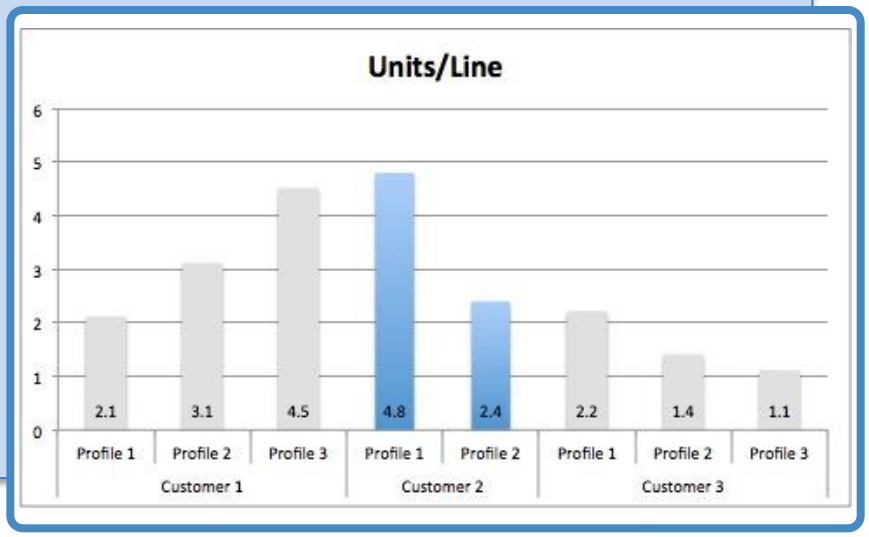
Order Profiles Through Data Models

Customer 2

- Apparel 3PL
- $14 Billion Revenue
- Wholesale, Retail
- Order Profiles
  - Retail Floor sets
  - Retail vs. Wholesale, “Push vs. Pull”
  - Jewelry



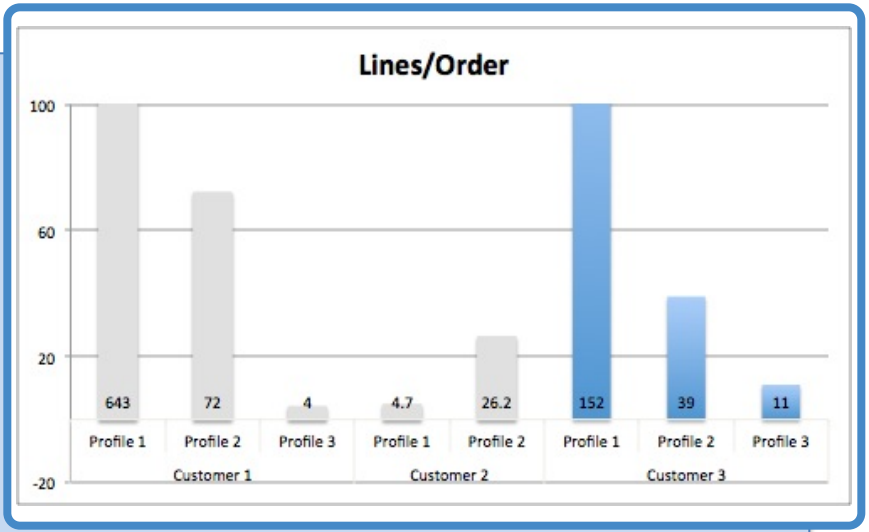


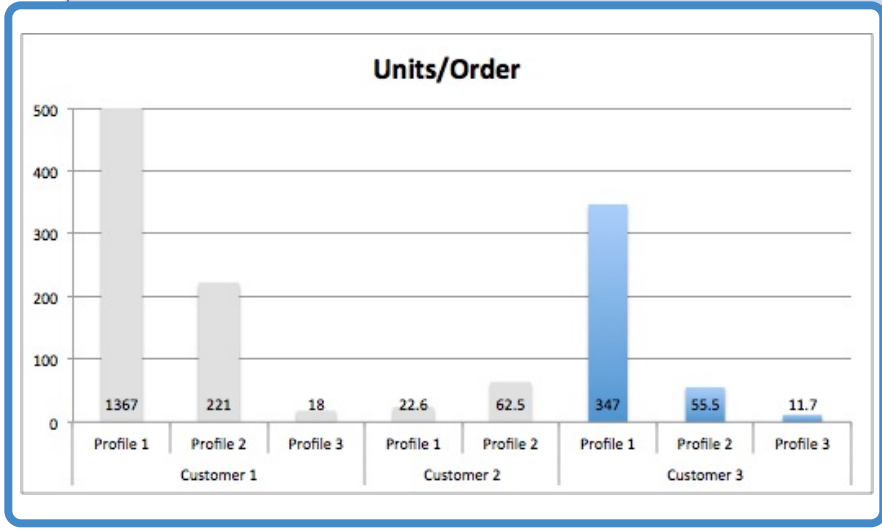


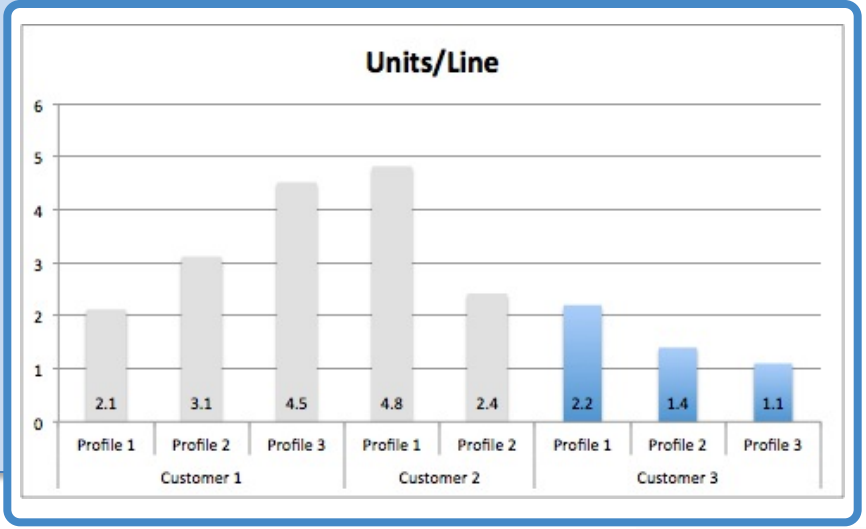
Order Profiles Through Data Models

Customer 3

- Wholesale Distributor
- $ 38 Billion Revenue
- C-Stores/Big Box/Store types
- Order Profiles
  - Split Case & Cigarette Orders
  - Full Case Orders
  - Non Conveyable & Pallet Orders







Don’t Guess…Guessing is Expensive

Objective: To reduce the standard deviation of units per put station.

$$Min \sum_{s \in S} \left(\sum_{o \in O_s} u_o - m_u \right)^2$$

Subject to:

$$\sum_{s \in S} \sum_{o \in O_s} u_o = u_{tot}$$

$$m_u = \left\lfloor \frac{u_{tot}}{n_{stn}} \right\rfloor$$

$$\sum_{s \in S} \sum_{o \in O_s} 1 = o_{tot}$$

$$\sum_{o \in O_s} 1 = \left\lfloor \frac{o_{tot}}{n_{stn}} \right\rfloor \quad \forall s \in S$$

Where:

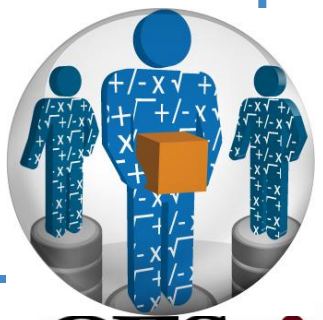
$$u_o \geq 0 \ \forall o \in O_s \ \forall s \in S$$
$$u_o \ integer$$

Where:

S is the set of stations
O_s is the set of orders in station s
u_o is the number of units in order o
u_{tot} is the total number of units
n_{stn} is the number of active stations
o_{tot} is the total number of orders

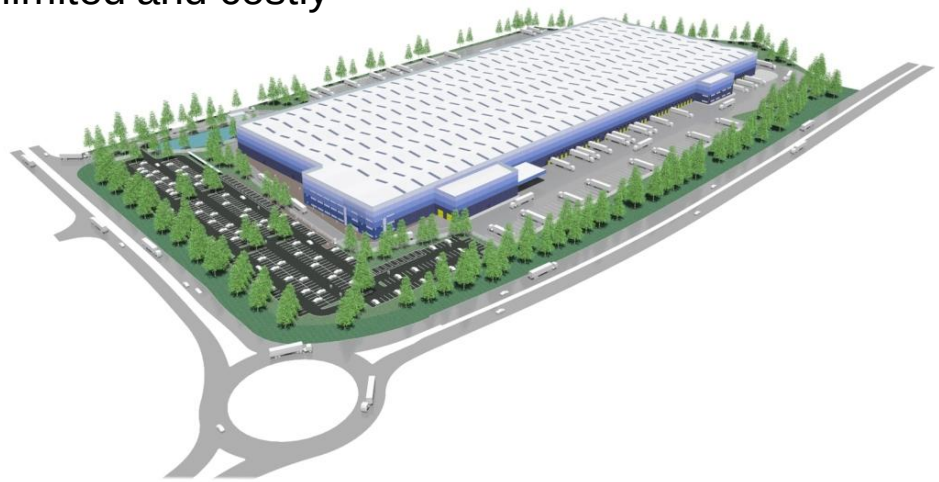
```
Batch batchObj = Batch.readInputToBatchObj(getCoreToPlanningFilePath(CORE_TO_PLANNING_ORDER_FILE_PREFIX));

Map<String, Order> orderMap = new TreeMap<String, Order>(batchObj.getOrderMap());

Map<String, Integer> ncOrderCartonMap = new HashMap<String, Integer>();
Map<String, Integer> wjOrderCartonMap = new HashMap<String, Integer>();
Map<String, Integer> fcOrderCartonMap = new HashMap<String, Integer>();
Map<String, Integer> ptsOrderCartonMap = new HashMap<String, Integer>();

System.out.println("Total units: " + batchObj.getTotalUnits(orderMap));
Map<String, Order> nonConOrders = batchObj.removeNonCon(orderMap);
System.out.println("Non Con units: " + batchObj.getTotalUnits(nonConOrders) + "\tCon Units: " + batchObj.getTotalUnits(orderMap));

for(String ordID: nonConOrders.keySet()) {
        int numCases = 0;
        for(String pickID: nonConOrders.get(ordID).getPickIDMap().keySet()) {
                int numFullCases = nonConOrders.get(ordID).getPickIDMap().get(pickID).getQty() / nonConOrders.get(ordID).getPickIDMap().get(pickID).getFullCaseQty();
                int numEaches = nonConOrders.get(ordID).getPickIDMap().get(pickID).getQty() % nonConOrders.get(ordID).getPickIDMap().get(pickID).getFullCaseQty();
                numCases +=  numFullCases + numEaches;
        }
        ncOrderCartonMap.put(ordID, numCases);
}

System.out.println("Total units: " + batchObj.getTotalUnits(orderMap));
Map<String, Order> whJwlOrders = batchObj.removeJwl(orderMap,"W");
System.out.println("Wh Jwl units: " + batchObj.getTotalUnits(whJwlOrders) + "\tNon Wh Jwl Units: " + batchObj.getTotalUnits(orderMap));

for(String ordID: whJwlOrders.keySet()) {
        wjOrderCartonMap.put(ordID, whJwlOrders.get(ordID).getExpNumCartons());
}

System.out.println("Total units: " + batchObj.getTotalUnits(orderMap));
Map<String, Order> fullCasePickOrders = batchObj.removeFCPicks(orderMap);
System.out.println("FC Pick units: " + batchObj.getTotalUnits(fullCasePickOrders) + "\tNon FC Pick Units: " + batchObj.getTotalUnits(orderMap));

System.out.println("Total units: " + batchObj.getTotalUnits(orderMap));
Map<String, Order> earlyPickOrders = batchObj.removeEarlyOrders(orderMap);
System.out.println("Early Pick units: " + batchObj.getTotalUnits(earlyPickOrders) + "\tRemaining Non FC Pick Units: " + batchObj.getTotalUnits(orderMap));

List<String> earlyPickIDs = new LinkedList<String>();
for(String ord: earlyPickOrders.keySet()) {
        earlyPickIDs.addAll(earlyPickOrders.get(ord).getPickIDMap().keySet());
}
for(String ordID: fullCasePickOrders.keySet()) {
        int numCases = 0;
        for(String pickID: fullCasePickOrders.get(ordID).getPickIDMap().keySet()) {
                numCases +=  fullCasePickOrders.get(ordID).getPickIDMap().get(pickID).getQty()/fullCasePickOrders.get(ordID).getPickIDMap().get(pickID).getFullCaseQty();
        }
        fcOrderCartonMap.put(ordID, numCases);
}

for(String ordID: orderMap.keySet()) {
        ptsOrderCartonMap.put(ordID, orderMap.get(ordID).getExpNumCartons());
}
```

1. Smooth work across put stations
2. Maximize throughput
3. Reduce cost/unit shipped



Why Build A New Automated DC?

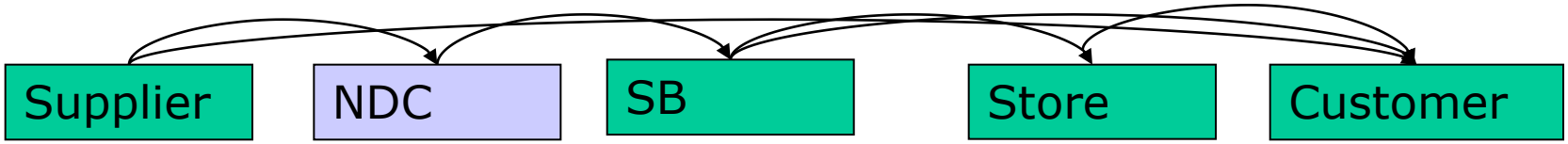
- Limitations of multiple small manual DCs
  - Wide and generally slow moving assortment means that manual DCs are space hungry
  - Shop order fulfilment is labor intensive and 40% of workers time is spent walking during picking process
  - Storage growth requirement outpaces DC capacity
  - D2C fulfilment is severely restricted
  - Manual DCs service capability is limited and costly
- Competition from other retailers
  - Non-traditional outlets
  - Catalog houses
  - Multi-channel suppliers



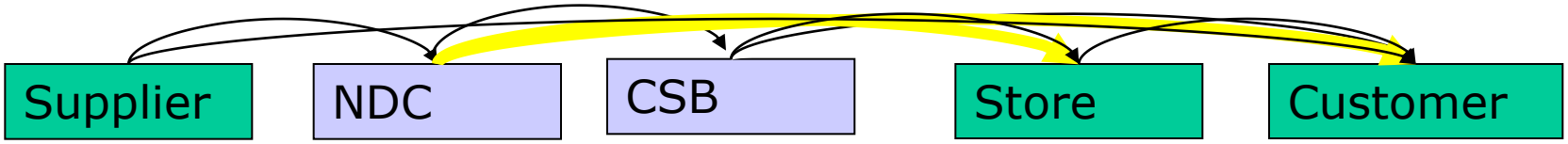
Retail Project

- Starting point

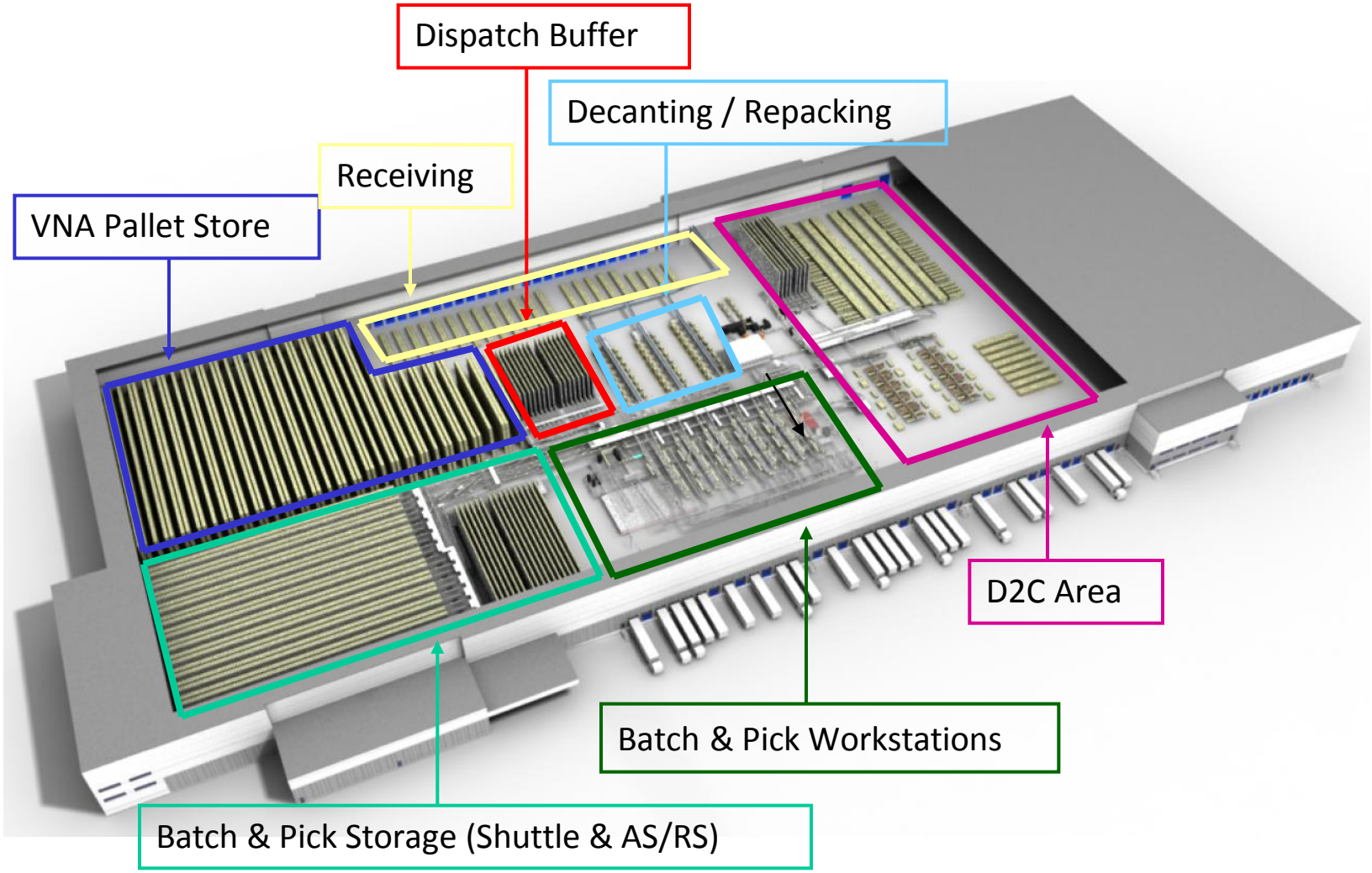
  450K SKUs, 13 sites totalling 2.4M sq ft



- Current Strategy



Retail Project Solution

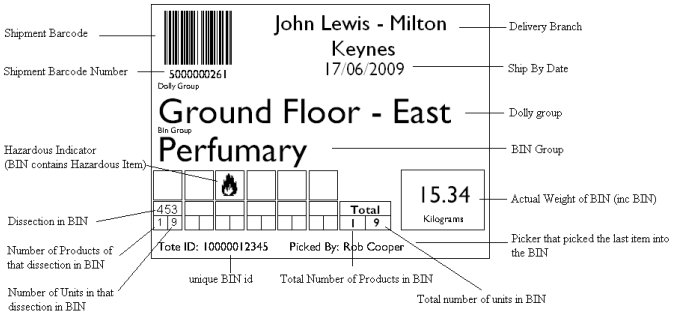


Targets Achieved

- Met supply chain goals for next 10 years
- Delivers network capacity to handle anticipated future sales growth
- Enhances store presentation and reduces inventory levels
- Facilitates a step change in branch and DC productivity
- Capable of multi-channel fulfillment
- Compatibility of different business models in one warehouse
- Supports store friendly delivery
- Solution to be flexible to react to seasonal fluctuations
- Modular and expandable
- Reduction of workforce and increasing efficiency and ergonomic aspects in all warehouse processes

Business Benefits

- Productivity – operational cost savings primarily from Branches
- Reducing supply chain costs as a % of sales
- Stock holding – reduction in stock holding across the business
- Availability – Improved availability on shelf
- Lead times – Improved lead times
- Range – Ability to expand D2C assortment across the binnable range



ROI Justification for Automation

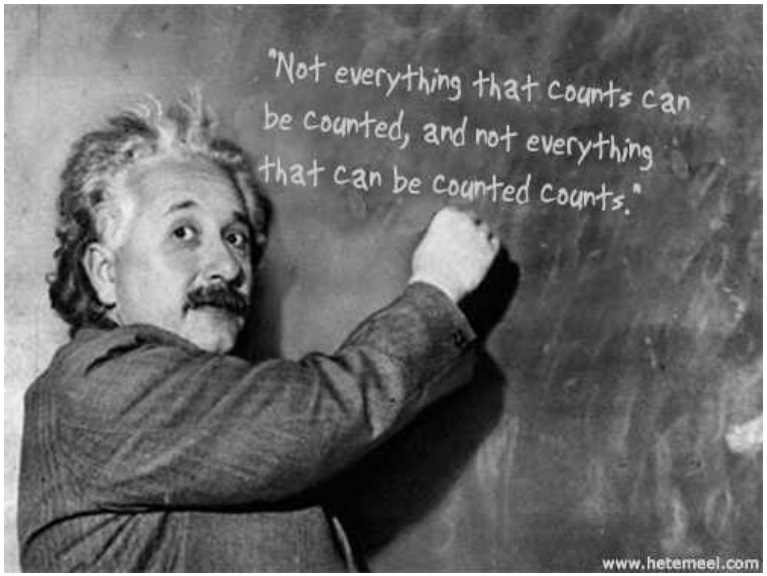
- Labor savings
- Business enablement
- Push back cut-off times
- Handle multi-channel in same facility
- Makes large facility more manageable
- Accuracy levels increase – order fulfilment and inventory
- Store friendly delivery
- Reduced transportation costs
- Smaller footprint
- Drive raw material costs out of supply chain
- Increases life expectancy of new facility
- Improved order/work processes
- Reduction in loss

ROI Simplified

System cost – Capital avoidance

Expected annual savings*

* Warehouse savings + supply chain savings + depreciation savings



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