NC STATE UNIVERSITY
POOLE COLLEGE OF MANAGEMENT | SCRC
SUPPLY CHAIN RESOURCE COOPERATIVE

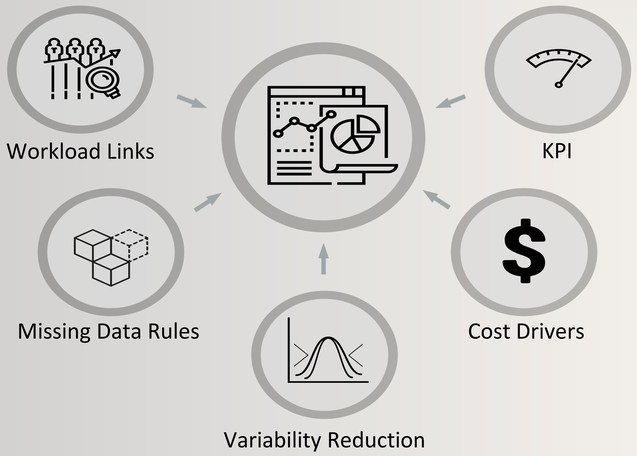
UPS Supply Chain Solutions: Missing Data

Cost Model Input Optimization

OBJECTIVE

Develop a strategy to address missing data and provide stakeholders with alternate methods to enhance cost estimation and resource allocation.

OVERVIEW



APPROACH

Data Pre-Processing
Cleaned customer warehouse activity data by removing anomalies.

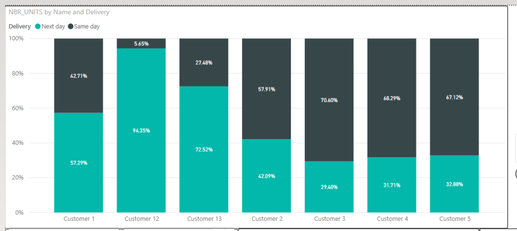
Exploratory Analysis
Generated descriptive statistics and basic visuals using Python libraries to understand the data.

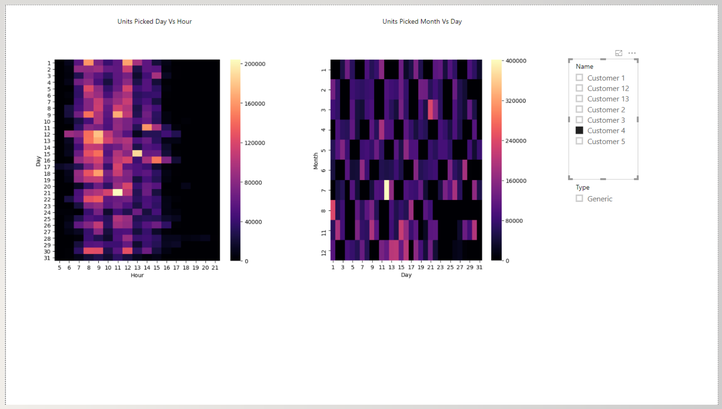
Modelling
Organized UPS SCS report outputs into a manageable database on a MYSQL server utilizing the TIDY data process.

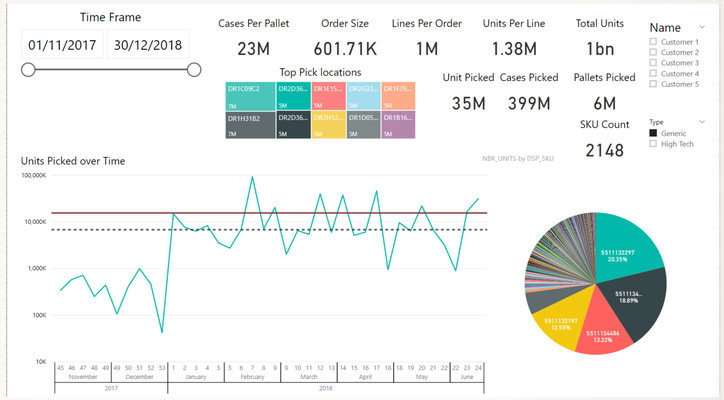
Dashboard Development
Developed key metrics necessary for cost model calculations. Leveraged Power BI's versatility to integrate python scripts and visuals.

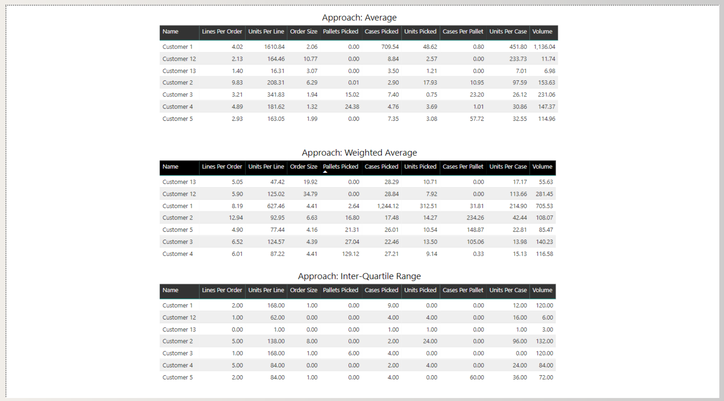
Dashboard Enhancement
Created additional visuals that provided meaningful insights and aided decision making with the ultimate goal of optimizing resource planning.

RESULTS









Name	Lines Per Order	Units Per Line	Order Size	Pallets Picked	Cases Picked	Units Picked	Cases Per Pallet	Units Per Case	Volume
Customer 1	4.02	1610.84	2.06	0.00	709.54	48.62	0.80	451.80	1,136.04
Customer 12	2.13	164.46	10.77	0.00	8.84	2.57	0.00	233.73	11.74
Customer 13	1.40	16.31	3.07	0.00	3.50	1.21	0.00	7.01	6.98
Customer 2	9.83	208.31	6.29	0.01	2.90	17.93	10.95	97.59	153.63
Customer 3	3.21	341.83	1.94	15.02	7.40	0.75	23.20	26.12	231.06
Customer 4	4.89	181.62	1.32	24.38	4.76	3.69	1.01	30.86	147.37
Customer 5	2.93	163.05	1.99	0.00	7.35	3.08	57.72	32.55	114.96

Name	Lines Per Order	Units Per Line	Order Size	Pallets Picked	Cases Picked	Units Picked	Cases Per Pallet	Units Per Case	Volume
Customer 13	5.05	47.42	19.92	0.00	28.29	10.71	0.00	17.17	55.63
Customer 12	5.90	125.02	34.79	0.00	28.84	7.92	0.00	113.66	281.45
Customer 1	8.19	627.46	4.41	2.64	1,244.12	312.51	31.81	214.90	705.53
Customer 2	12.94	92.95	6.63	16.80	17.48	14.27	234.26	42.44	108.07
Customer 5	4.90	77.44	4.16	21.31	26.01	10.54	148.87	22.81	85.47
Customer 3	6.52	124.57	4.39	27.04	22.46	13.50	105.06	13.98	140.23
Customer 4	6.01	87.22	4.41	126.12	27.21	9.14	0.33	15.13	116.58

Name	Lines Per Order	Units Per Line	Order Size	Pallets Picked	Cases Picked	Units Picked	Cases Per Pallet	Units Per Case	Volume
Customer 1	2.00	168.00	1.00	0.00	9.00	0.00	0.00	12.00	120.00
Customer 12	1.00	62.00	0.00	0.00	4.00	4.00	0.00	16.00	6.00
Customer 13	0.00	1.00	0.00	0.00	1.00	1.00	0.00	1.00	3.00
Customer 2	5.00	138.00	8.00	0.00	2.00	24.00	0.00	96.00	132.00
Customer 3	1.00	168.00	1.00	6.00	4.00	0.00	0.00	0.00	120.00
Customer 4	5.00	84.00	0.00	0.00	2.00	4.00	0.00	24.00	84.00
Customer 5	2.00	84.00	1.00	0.00	4.00	0.00	60.00	36.00	72.00

CONCLUSIONS

Customer Data Consolidation
The dashboard has been used to consolidate and compare order profiles of existing customers to estimate those of potential customers.

Alternatives to existing approach
Provided multiple point measures to quantify key metrics as an alternative to method of averages.

Staffing Optimization
Analysing trends in picking activity provides an opportunity to optimize warehouse staffing and identify root causes.

RECOMMENDATIONS

Real Time Linkage into WMS
Link dashboard directly with Warehouse Management Systems (WMS) to leverage constant analysis capability.

Bin Size Standardization
Periodic recategorization of bins and reassignment of weights to estimate the key metrics in the cost model.

Basis for Predictive Analytics
Abundance of time series data should be leveraged to develop a predictive model to forecast warehouse activity and optimize staffing.

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