

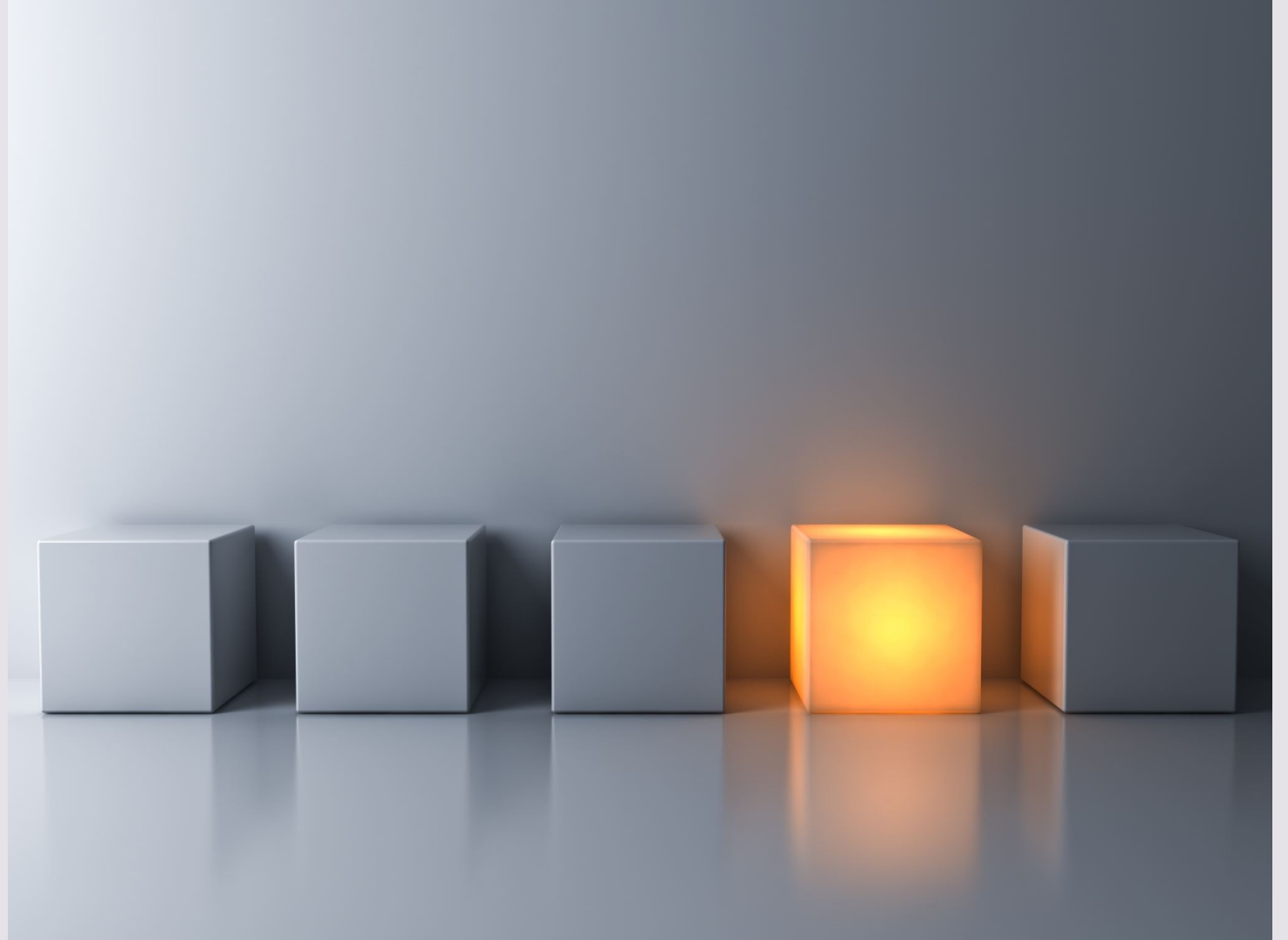
How do Businesses Return a Package?



1. Receiving Dock (Conveyor)



2. Staging Area (Returns)



3. Scanning Process





4. Return Setup Station

5. SAP Returns Process

Material	10000000000000000000	WHOLESALE/WH/GRUETT 2 100000
Batch	00000000092	
Plant	1020	

Basic data 1	Basic data 2
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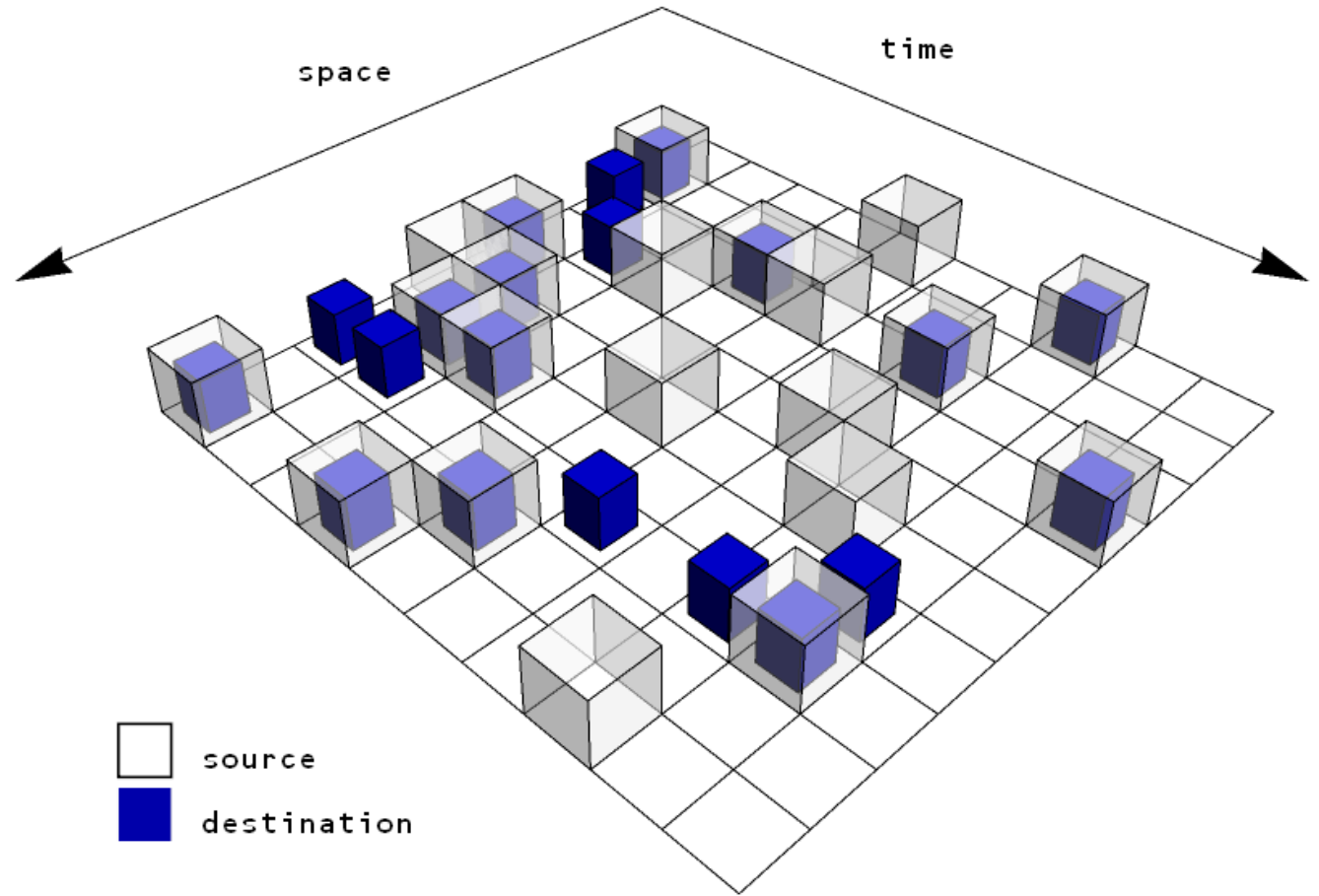
Expiration Date	
Production Date	
Shelf Life Exp. Date	31.03.
Available From	
Period Indicator	D

Miscellaneous	
Next Inspection	
Valuation Type	000000

Trading Data	
Vendor	10022
Vendor Batch	
Last Goods Receipt	09.08.

Technical Information	
Screen Data	
Program Name	SAPLCHRG
Screen Number	2100
GUI Data	
Program Name	SAPLCHRG
Status	BATCH
Field Data	
Table Name	DFBATCH
Table category	Struct.
Field Name	MHD_IO
Data Element	MHD_IO
DE Supplement	0
Field Description for Batch Input	
Screen Field	DFBATCH-MHD_IO
Program Name	SAPLCHRG

6. Disposition (Scrap, Restock, Analysis)



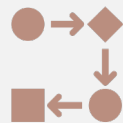
How much
time did that
entire
process take?



How much costs are used to maintain this process?



What steps regularly take the longest amount of time?



Are there ways to continually improve this process?

RMA Process Cycle Time Reduction at Honeywell TX-55

The Honeywell logo, consisting of the word "Honeywell" in white, bold, sans-serif font, set against a red rectangular background.

Presentation by:

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Jordan Barclay

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Senior Design

Dr. Smith

May 4th, 2023

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Objective

Reducing the total Process Cycle Time for Return Merchandise Authorization (RMA).

Applying a technical scope for long-term advancements on a physical and technological level.

Proper suggestions to lower cycle times can save costs of up to \$156,000 per year.

Honeywell at TX-55 runs on SAP software, so we certified ourselves as SAP Technological Consultants.

Element	Description	Project Information			
0. Project Title	Give a brief project title (five words or less)	RMA Process Cycle Time Reduction			
1. Area of Focus or Function:	E.g., Manufacturing, Sales, HR, Purchasing, Engineering etc.	RMA Returns			
2. Problem Statement	Give a brief history of the problem this project will solve (not the solution)	Provide Robust efficient process on disposition and accumulation of RMA returns.			
3. Benefit to Customers:	Who is the customer, what benefit will they see and what are their most critical requirements?	Honeywell TX55, by applying six-sigma green belt project a more robust RMA process could implement less accumulation and timely RMA returns disposition.			
4. Project Metrics:	What improvement is targeted and what will be the impact on your metrics?	Metrics:	Baseline	Goal	Units
	Type the name of the metric under "Metrics" I.e.: Sigma value, defects, yield, capacity, cycle time, closure rate, etc. Ideally, should not be in dollars.	RMA Cycle Time	23:00:00	14:00:00	Hours
5. Business Impact	What is expected annualized business impact (\$)?	COST AVOIDANCE 7.25 USD Man Hours Cost x 9 hrs (Cost Avoidance) x 2400 RMA's per year = 156,600 USD/YEAR			

Objective

- SAP ERP Software is the standard for how Honeywell organizes their RMA logistics.^[1]
- SAP ERP is constantly evolving, similar to every other technology from SAP.^[2]



Organization (SAP Activate Roadmap)

The SAP Activate Roadmap Conceptually Organizes each step of a project with layouts to analyze each step further

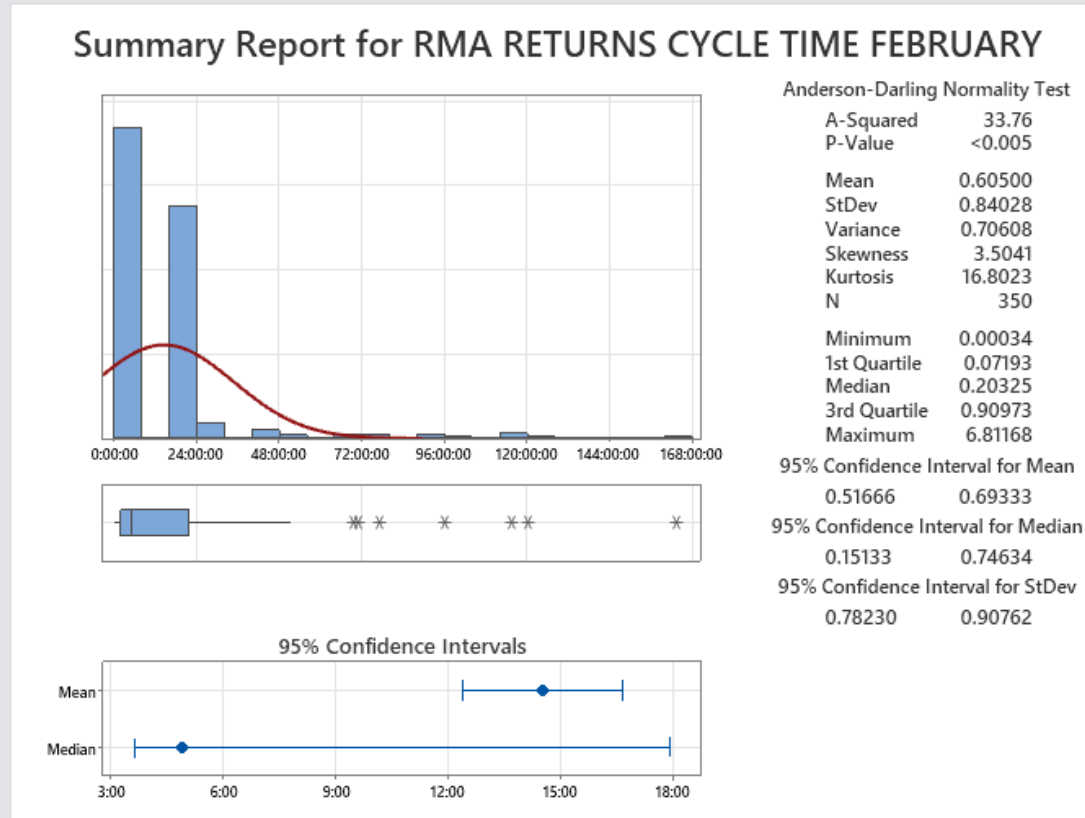
Since the step is a technical project, the roadmap ends at the Realize phase. Otherwise, the Roadmap would have a Deployment and Run phase.

This provided graph shows the concepts, software, procedures, and results in the data.

	Discover	Prepare	Explore	Realize
Receiving Dock	Standard Infrastructure	AUTOCAD Facility Layout AnyLogic Layout	Automatic Conveyor Speed Less Employee Utilization	Optimal Layout Intact
Staging Area Returns	Conveyor systems Forklift Systems	AUTOCAD Facility Layout AnyLogic Layout AutoDesk Fusion 360	Forklift Directions	Considerable Minor Reduction Less Employee Cost
Scanning Process	Direct Transferability	AnyLogic Layout R Statistical Software	Remote Scanning	Considerable Major Reduction Linked With SAP Returns
Returns Setup Station	Forklift Maneuvrability	AnyLogic Layout	Integrate with SAP Returns	Considerable Minor Layout
SAP Returns Process	SAP S/4HANA Automation	R Statistical Software AutoDesk Fusion 360	Integrate with Returns Setup	Considerable Major Reduction Linked With Scanning Process
Disposition	Automatic Assortment Mechanism (Conveyor)	AutoDesk Fusion 360 AnyLogic Layout	Automated Assortment Automated Conveyor	Considerable Major Reduction Linked With Scanning Process Linked With SAP Returns
Analysis Returns	Department Arrangement	SPIRAL AUTOCAD Facility Layout	Facility Adjustment Safe Storage	Optimal Layout Intact
Scrap	Department Arrangement	SPIRAL AUTOCAD Facility Layout	Facility Adjustment Safe Storage	Optimal Layout Intact
Re-Stock	Department Arrangement	SPIRAL AUTOCAD Facility Layout	Facility Adjustment Safe Storage	Optimal Layout Intact

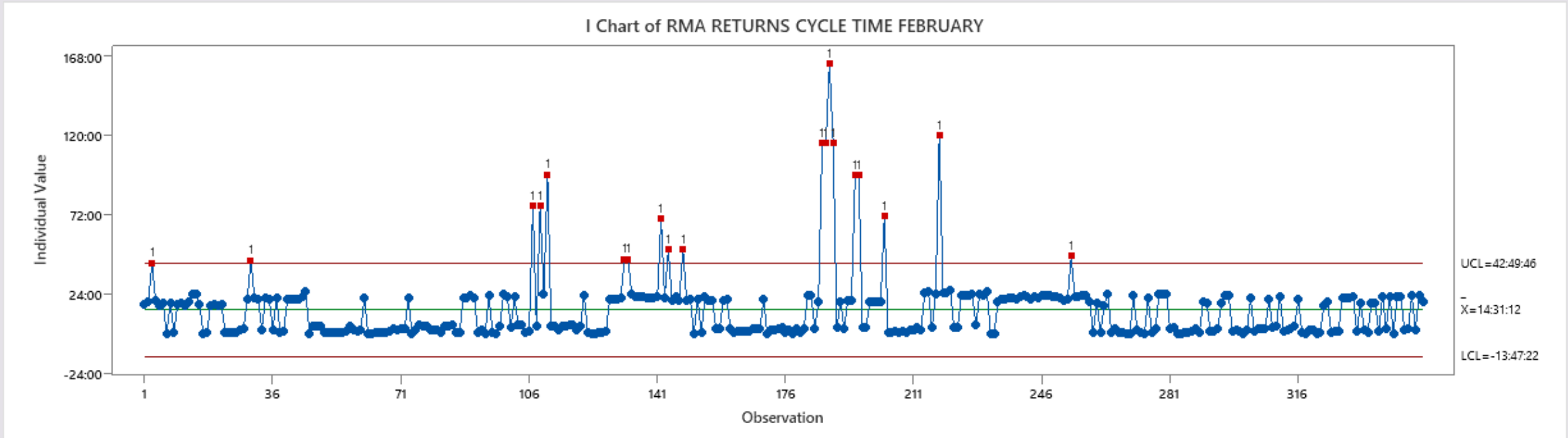
Gathering Data

- The following data represents the RMA returns cycle time from February of this year. The total hours worked this month was 168, and there are 350 data entries, each with a different time stamp of how long the cycle time occurred.
- From this, we can see there is a great amount of null data at the 0-hour mark, as well as several entries around the 24-hour range.



RMA RETURNS CYCLE TIME FEBRUARY	
1	17:37:13
2	19:01:05
3	42:59:32
4	19:51:54
5	16:53:53
6	18:45:58
7	0:00:34
8	18:33:47
9	0:50:18
10	17:55:30
11	18:48:43
12	17:11:32
13	19:29:34
14	24:00:00
15	24:00:00
16	17:51:12
17	0:04:02
18	0:41:21
19	17:10:29
20	18:01:24
21	17:25:24

Data Analysis

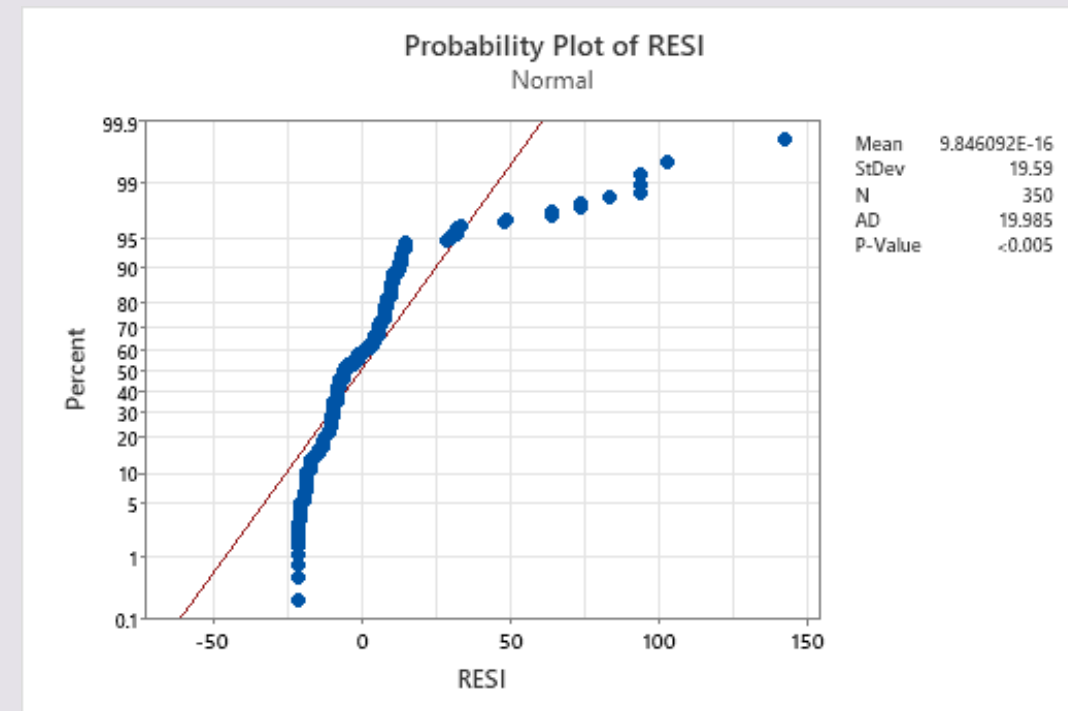


Above is an Individual Chart of the RMA Returns Cycle Time from February, displaying a mean of $\bar{x} = 14:31:12$, from each of the individual observations. The upper and lower control limits are also shown, and we see how many of the data points are out of control by them surpassing the upper control limit of 42:49:46

Data Analysis

- To work with a solid individual number instead of a time stamp, we extracted the hour value from each of the 350 data entries.
- Since this data was taken from one month, we split up the data entries into 5 weeks, with 70 data points correlating to each week.
- We then performed a One-Way ANOVA test to store the residuals from this data, which represent the difference between an observed value and its corresponding fitted value.
- We performed a normality test for the residual data.
- With a p-value less than $\alpha = 0.05$, the residuals are not normally distributed.

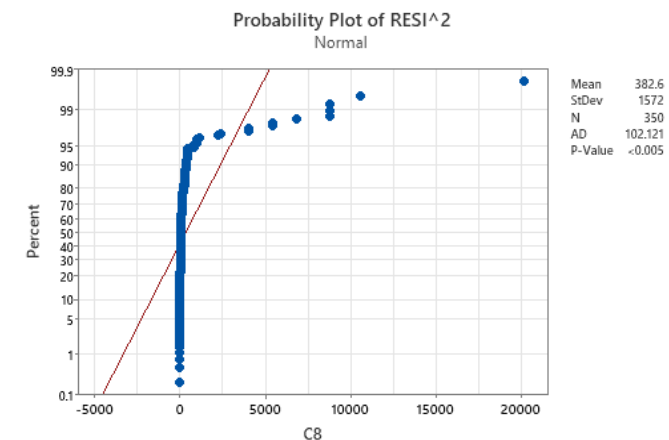
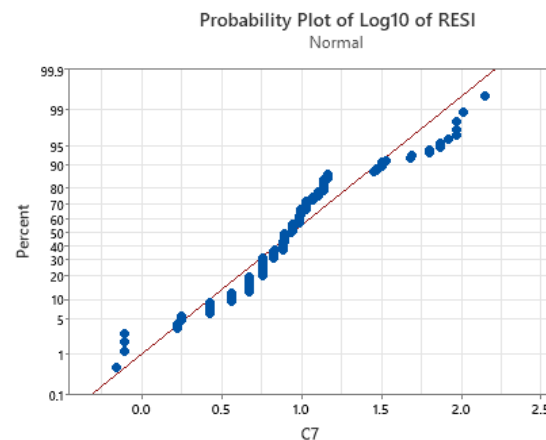
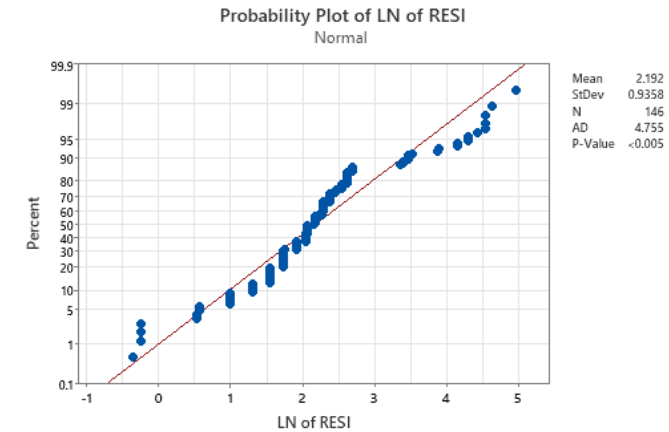
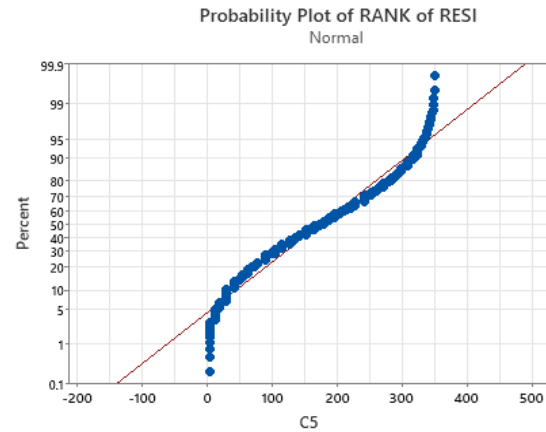
Hour Extracted	Week	RESI
17	1	6.757
19	1	8.757
42	1	31.757
19	1	8.757
16	1	5.757
18	1	7.757
0	1	-10.243
18	1	7.757
0	1	-10.243
17	1	6.757
18	1	7.757
17	1	6.757
19	1	8.757
24	1	13.757
24	1	13.757
17	1	6.757
0	1	-10.243
0	1	-10.243
17	1	6.757
18	1	7.757
17	1	6.757



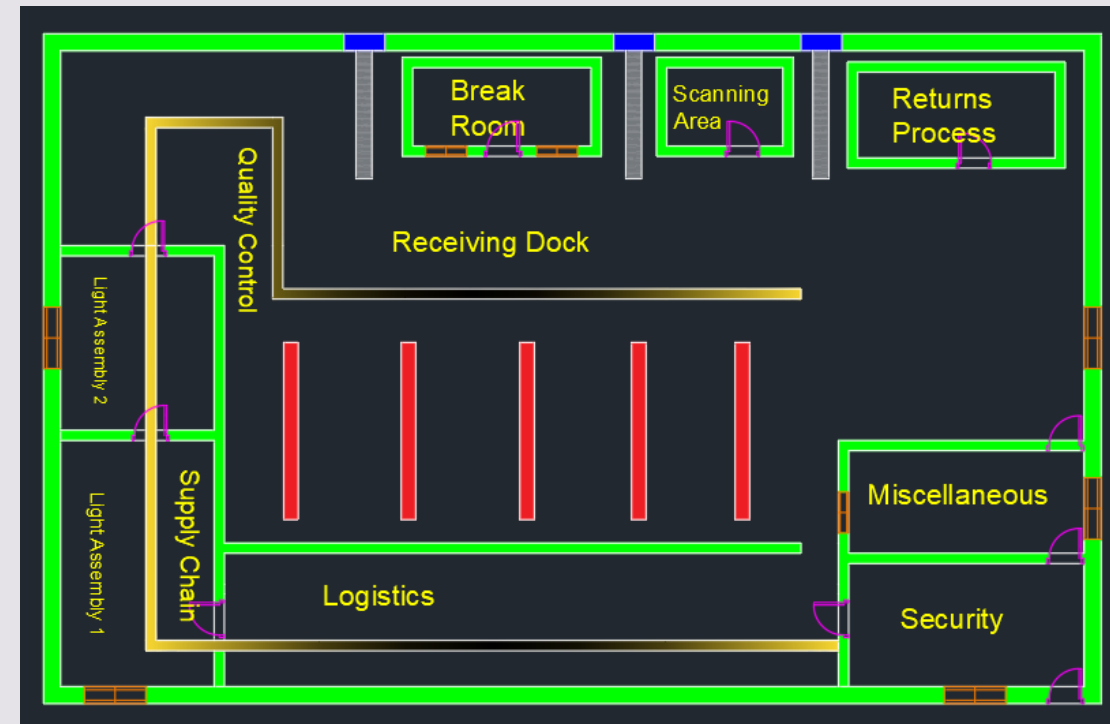
Data Analysis

- To manipulate the data, we performed several transformations including ranking the residuals, calculating the natural log as well as the logarithm to base 10 of the residuals, and finally squaring the residuals.
- Though none of these were successful in normalizing the data, the first three graphs were the closest to being normally distributed.

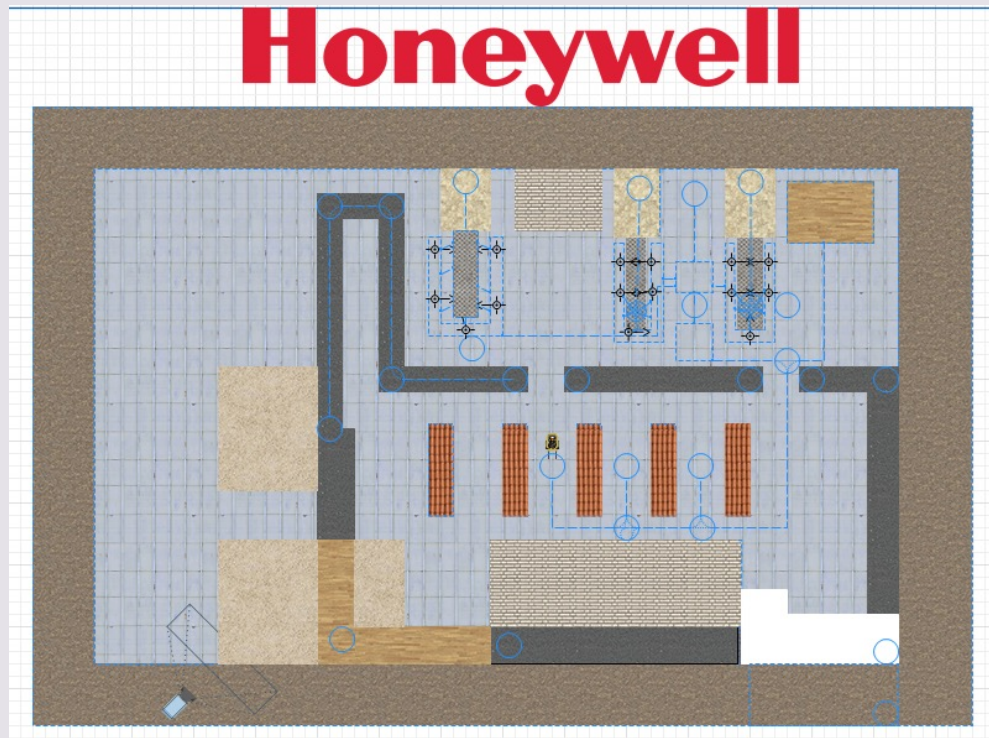
Rank of RESI	LN of RESI	Log10 of RESI	RESI^2
253.0	1.91060	0.82976	45.7
279.0	2.16987	0.94236	76.7
335.0	3.45812	1.50184	1008.5
279.0	2.16987	0.94236	76.7
249.0	1.75044	0.76021	33.1
264.5	2.04861	0.88970	60.2
90.0	*	*	104.9
264.5	2.04861	0.88970	60.2
90.0	*	*	104.9
253.0	1.91060	0.82976	45.7
264.5	2.04861	0.88970	60.2
253.0	1.91060	0.82976	45.7
279.0	2.16987	0.94236	76.7
326.5	2.62156	1.13853	189.3
326.5	2.62156	1.13853	189.3
253.0	1.91060	0.82976	45.7
90.0	*	*	104.9
90.0	*	*	104.9
253.0	1.91060	0.82976	45.7
264.5	2.04861	0.88970	60.2
253.0	1.91060	0.82976	45.7



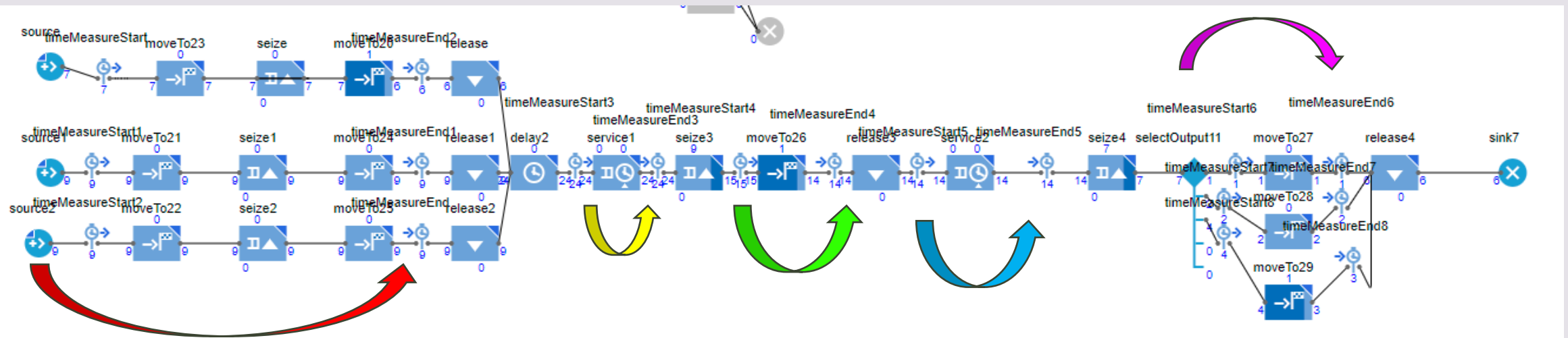
Current Simulations (Google Earth/AutoCAD)



Current Simulations (AnyLogic)



Process (AnyLogic)



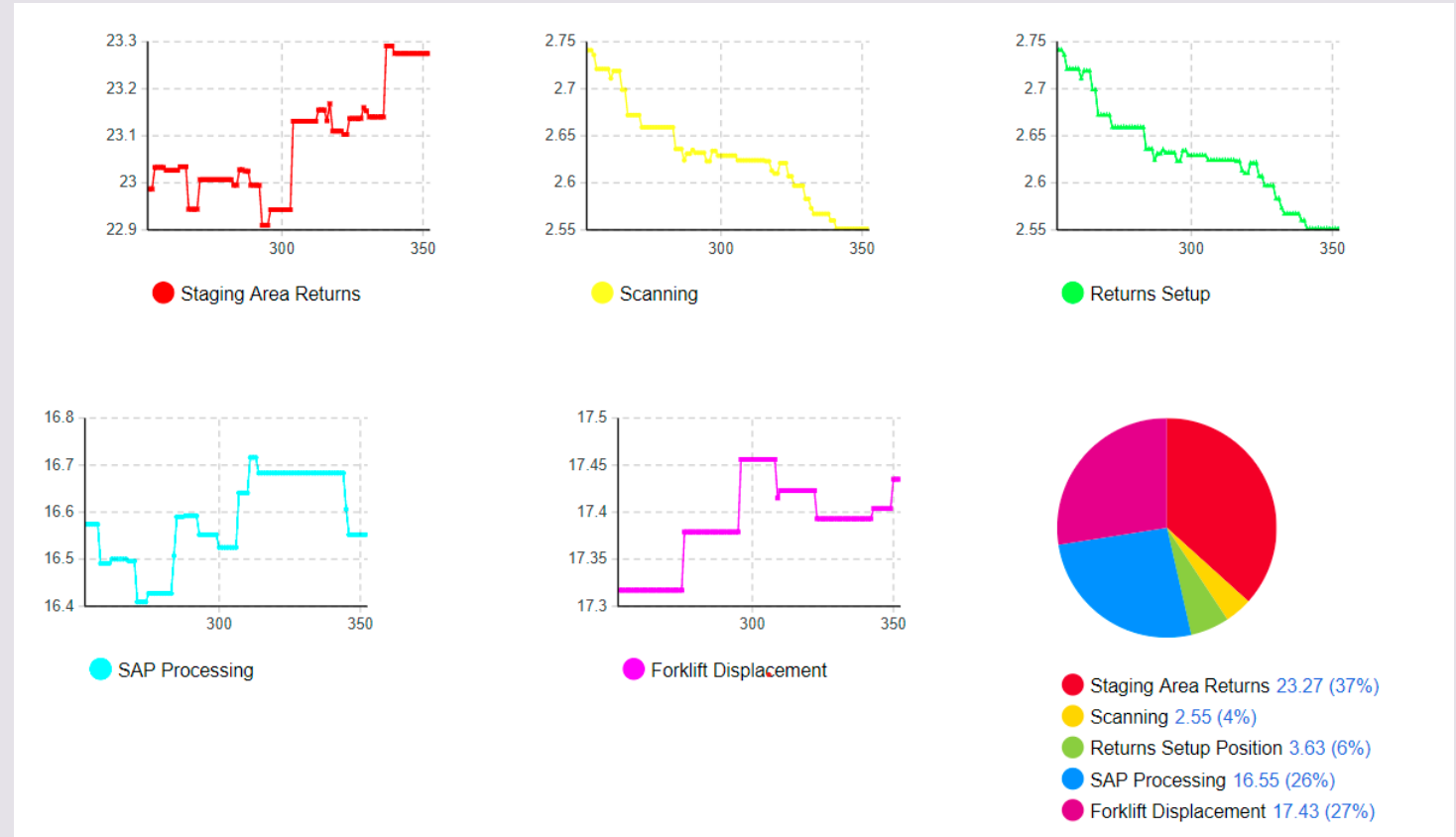
Legend:

Staging Area Returns ->
Scanning ->
Return Setup Station ->
SAP Processing ->
Disposition (Forklift) ->

Receiving Dock -> Staging Area Returns -> Scanning Process -> Returns Setup Station -> Disposition -> Analysis/Scrap/Restock

Current Results (AnyLogic)

- Staging Area Returns yields 37% of the overall process
- SAP Process yields 26% of overall process
- Forklift Displacement yields 27% of the overall process



ShipERP: Create Shipment

Execute Track Shipment Cancel Shipment Reports Change HU Manual Shipment Trailer Management

External HU 4561 Shop Rates HuCnt 1 Pkg 1 of 1 Auto Rate Shop Auto Ship

Sold To Ship From Ship To Small Parcel FedEx Contents Previous Shipment

Name ATLANTA COMPANY
 Attention ATTN JOHN DOE
 Addr 1 2345 GLENLAKE PKWY
 Addr 2
 City ATLANTA State/Prov GA
 Postal code 30328-3447 Country US
 Phone/Fax 999-999-9999 / 999-999-9999
 Customer # 0000003250

Address Validation

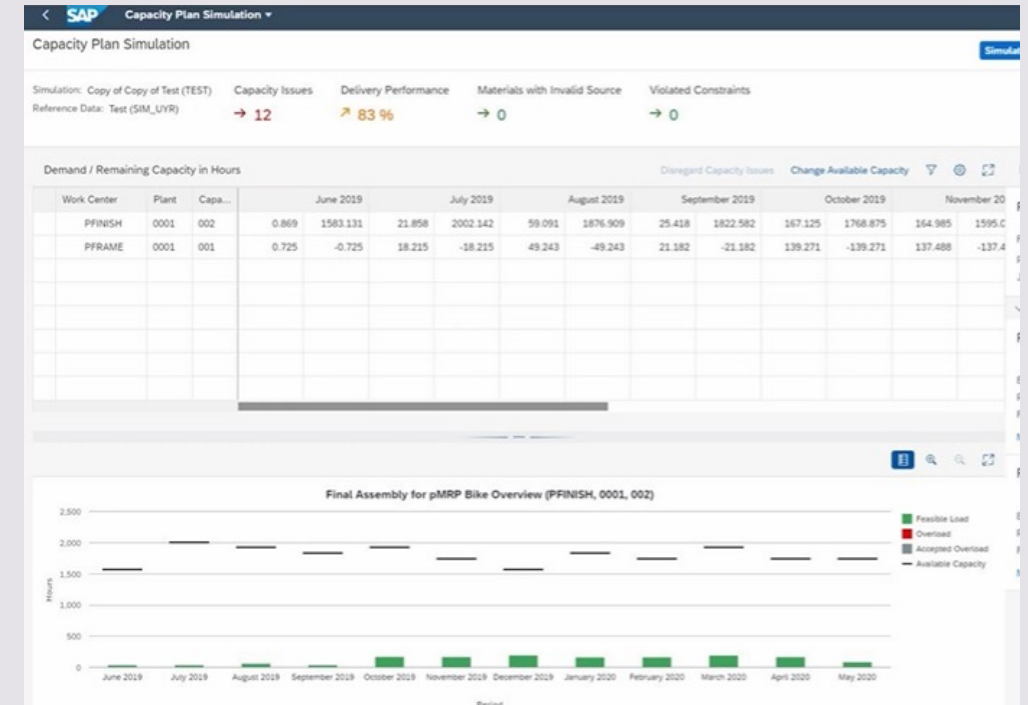
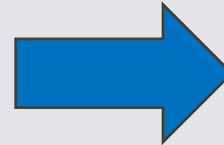
Shipment
 Carrier FedEx Ship Date 11/15/2010
 Service FedEx Ground

Payment
 Payment Pre Paid 3PICOLL Acct
 3PICOLL Zip 3PICOLL Country

Packaging
 Packing Customer Package 1 of 1
 Weight via HU 0.50 LB

Carrier Service Rates

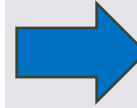
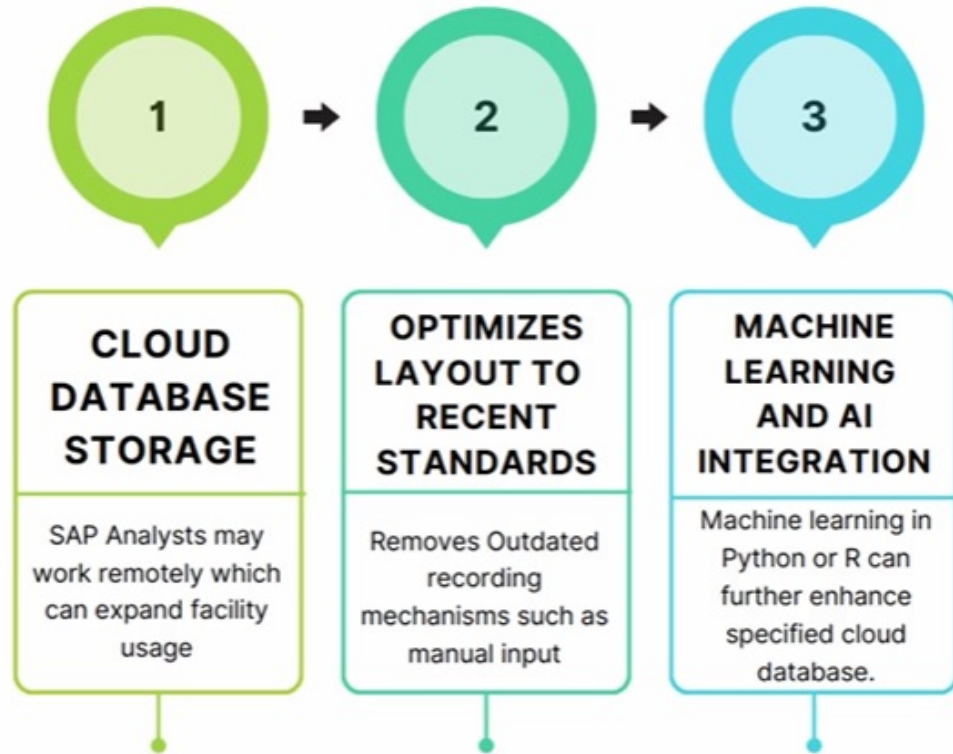
Carrier Code	Carrier Name	Carrier Service ID	Carrier Service	Carr Rate	Currency	Transit Tm	Delivery Date	Priority
FDXG	FedEx Ground	FEDEX_GROUND	FedEx Ground	6.12	USD	5.00	11/20/2010	1
FDXE	FedEx Express	FEDEX_EXPRESS_SAVER	FedEx Express Saver	14.74	USD	3.00	11/18/2010	1



SAP Processing Suggestions

- SAP ERP R/3 was last updated in 1995, and it is projected to lose SAP database support by 2027.^[8]
- However, SAP S/4HANA offer cloud data base storage and much faster processing features.^[11]

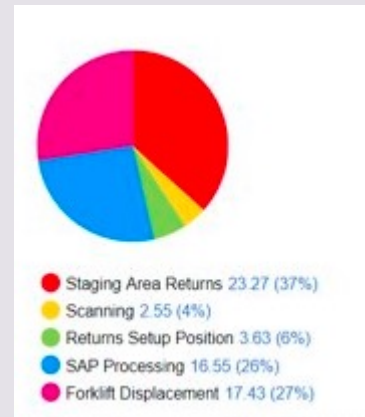
Benefits of SAP S/4HANA



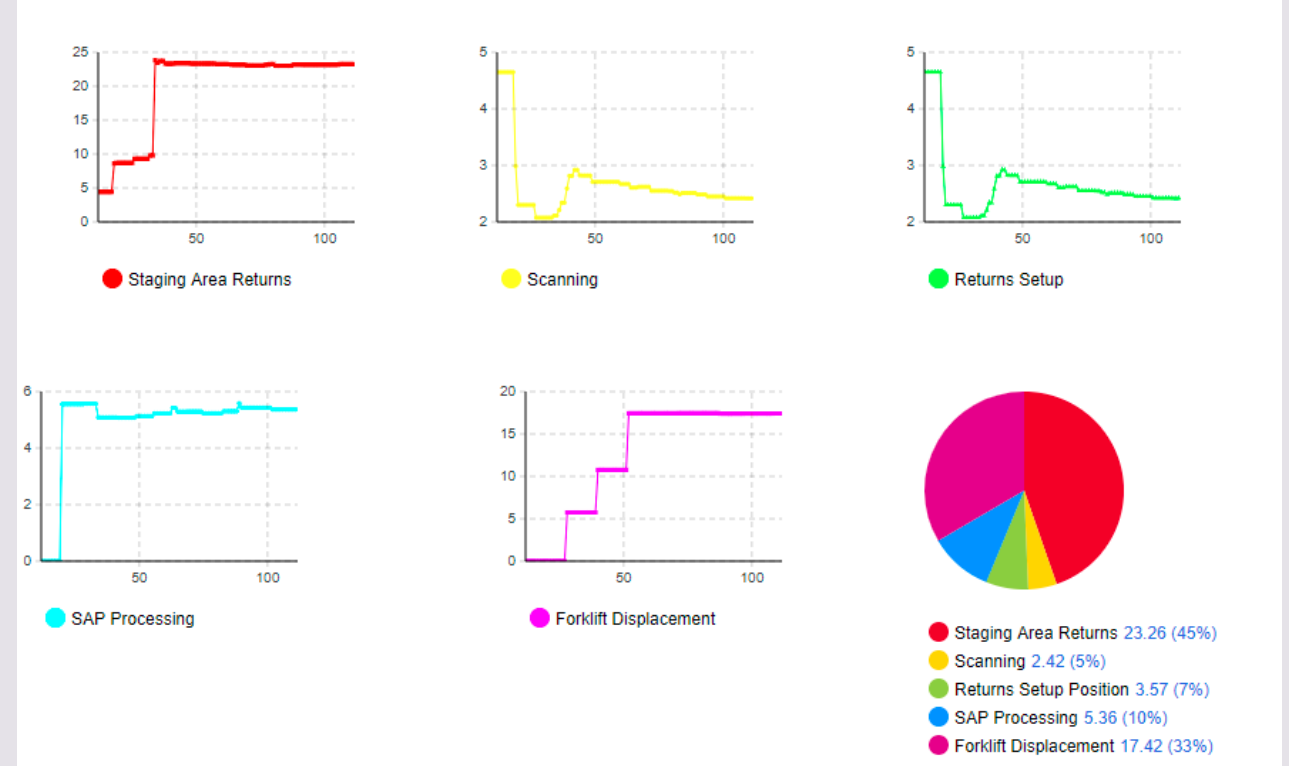
```
1 x = readline(prompt = "is the item defective? (1 for yes, 0 for no) ")
2 if(x == 0) {print("send item to restock")}
3 else(y = readline(prompt = "can this item be further analyzed? (1 for yes, 0 for no)
4 if(y == 0){readline("this item must be utilized for scrap")}
5 else{readline("send this item to analysis disposition")}]}
```

Reduced SAP Processing Results

- SAP Processing dropped from 26% of overall process time to 10%
- However, Staging Area Returns and Forklift Displacement increased due to relative comparisons.
- Nevertheless, those respective reduction suggestions are explained further.



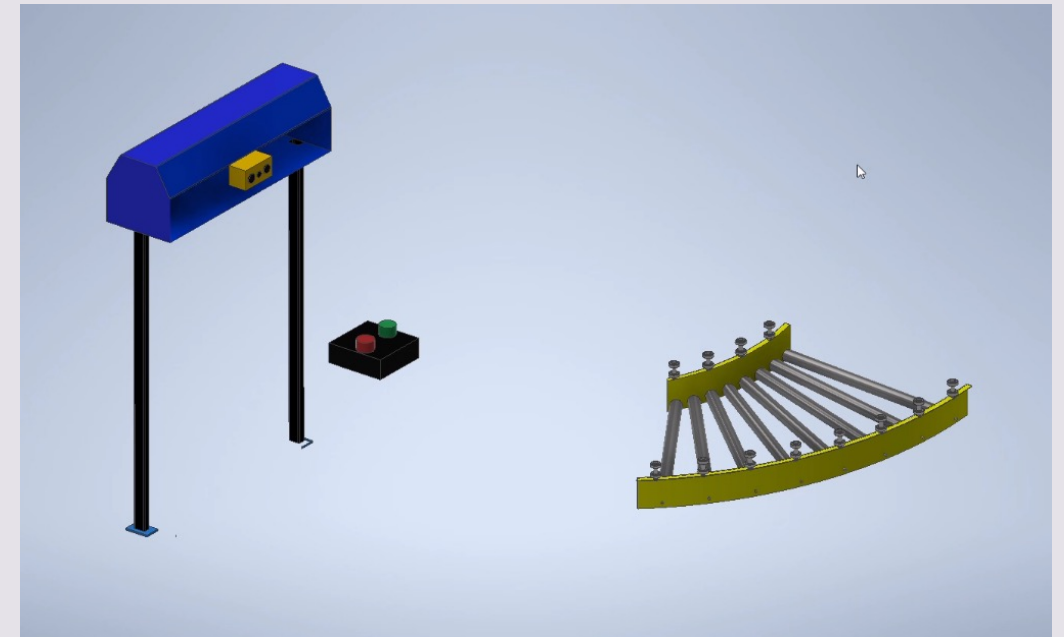
*original



Automated Conveyor



- Using the Inventor Autodesk program, we analyzed new conveyor designs that would automatically scan and move products that arrive at the receiving docks.
- This reduces the amount of workers manually pushing boxes reducing the cost of labor.^[12]



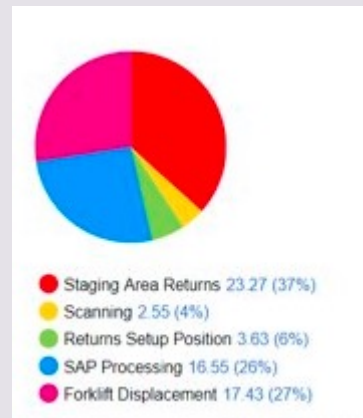
Reduced Staging Area Results

- Staging

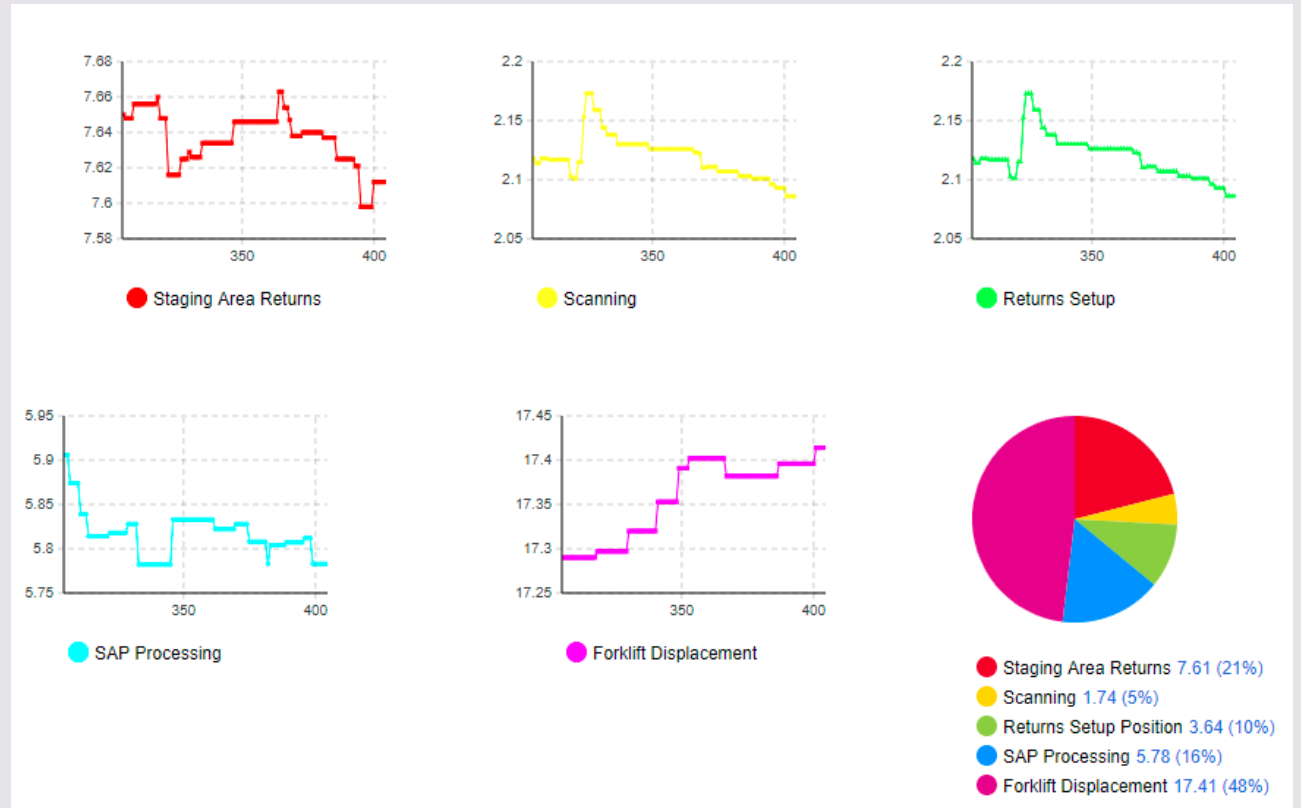
Returns dropped from 37% of overall process time to 21%

- Scanning also slightly decreased in time due to automatic scanner.

- Lastly, Forklift Displacement needs to be reduced as it currently yields 48% of the total time.



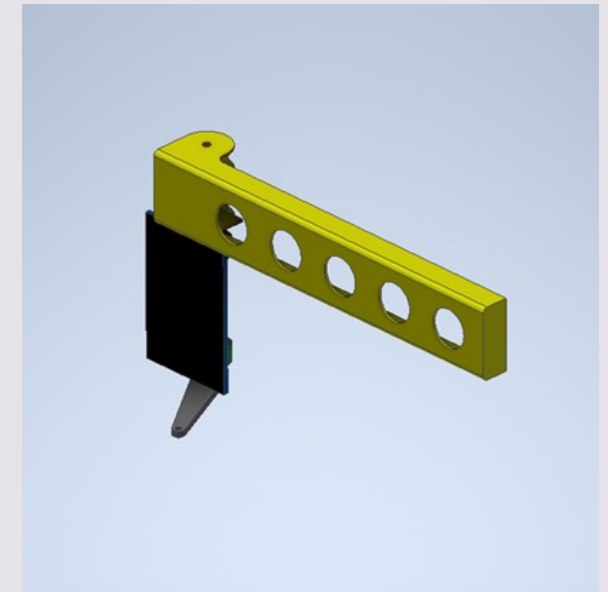
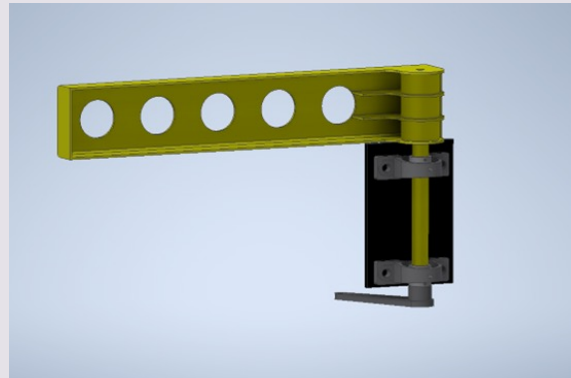
*original



Automated Disposition



- Also using the Inventor Autodesk program, we extended the conveyor to sort the products that arrive at the receiving docks.
- Disposition of RMA returns are more efficient and don't have to be manually moved to destination.^[15]



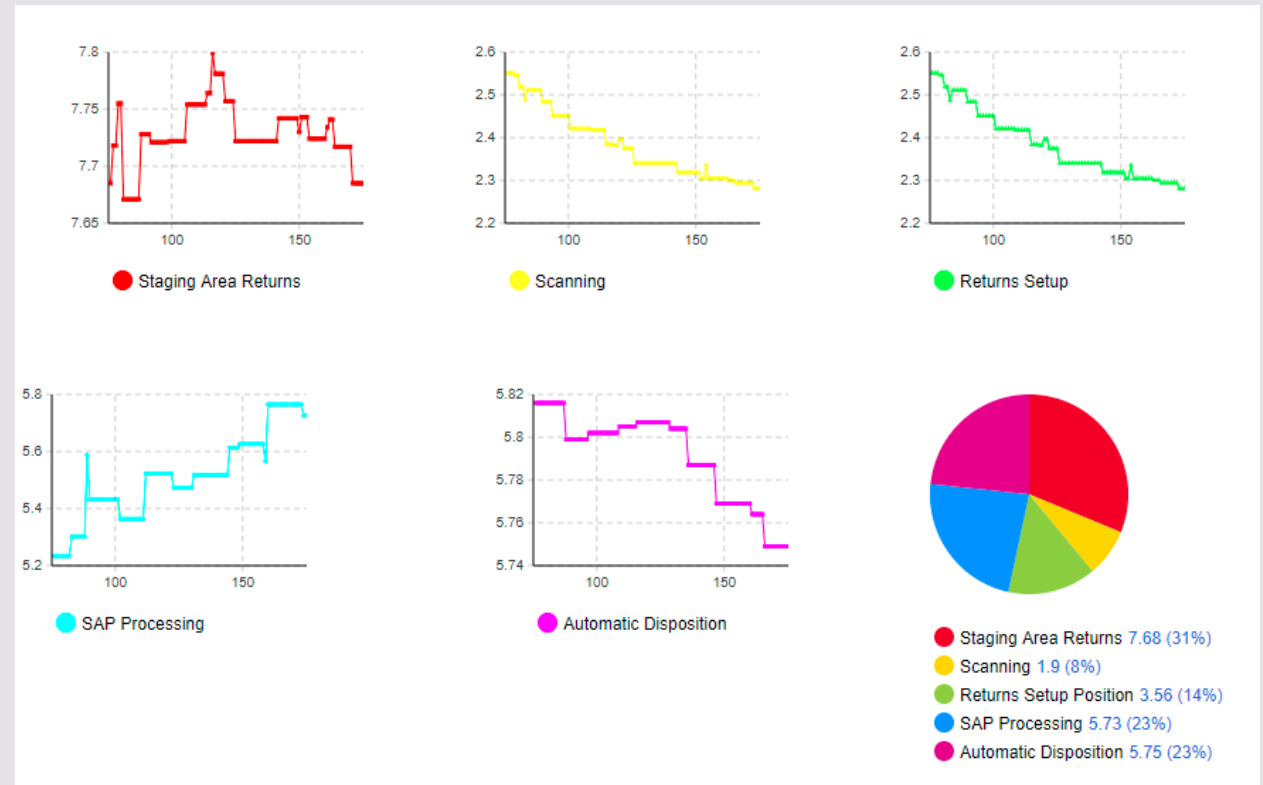
Reduced Disposition Results

- Disposition dropped from 27% of overall process time to 23%.

- The expanded percentages for scanning and return setup position implies better normalized data distribution with each process.



*original

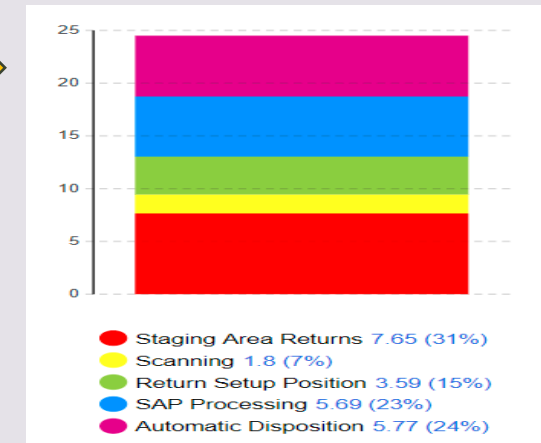
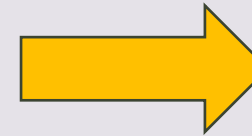
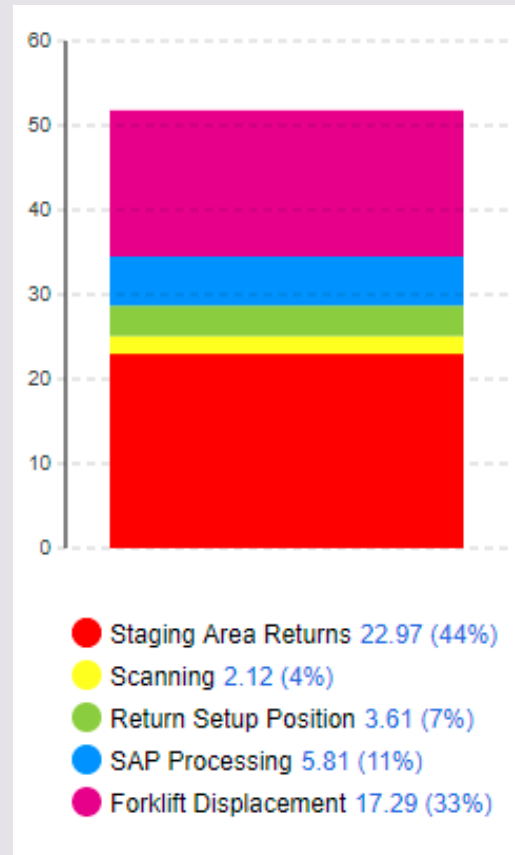


Total Simulation Recap (Video)



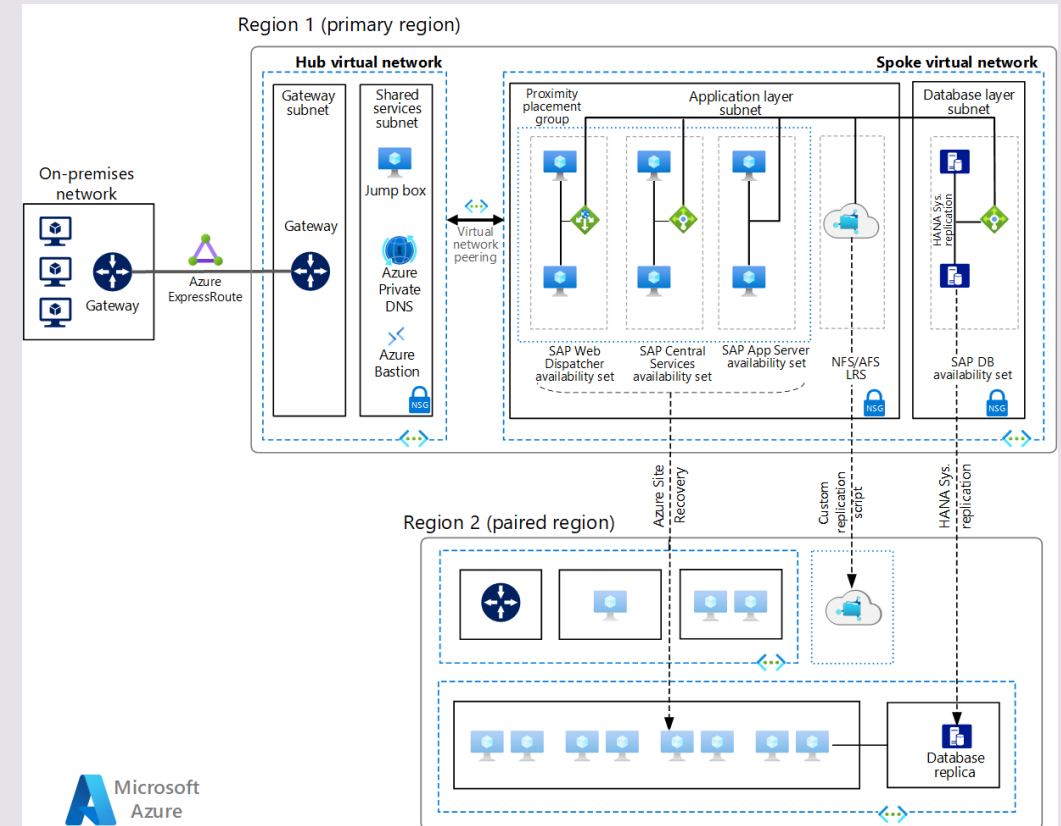
Overall Projected Results

- The comparative stack charts of the models show an overall reduction of 52.2 seconds to approximately 24.8 seconds (47.5 percent reduction).
- Correlating to the 23:00:00 baseline time, RMA Cycle Time is projected to decrease to 12:39:01. Nearly 1.5 hours less to our goal time.
- Thus, even if the technical designs yield suggested implementation errors, reaching the target time is more than feasible.



Conclusion

- Several of these technical designs have projected a positive trend in reducing RMA Cycle Time (Specifically, for SAP Processing, Return Stage Areas, and Disposition).
- While this study concludes itself at the Realization Stage of the SAP Activate Roadmap, implementation to transition servers to SAP S/4HANA is certainly possible (e.g. PayPal, Cisco, U.S. Army).^[13]
- Automated Conveyors and Dispositioning Machines may cost a high initial budget for instillation and implementation, however the extended amount of reduced costs in employment utilization would result in a net profit over time.



Conclusion

Who is your Customer, and their Needs & Requirements.

Sr. Quality Engineering Gustavo Coronado from Honeywell at TX-55 Needed the group to reduce Process Cycle Time for their Return Merchandise Authorization, and the Requirements was to utilize the data of the facility for analysis.

What system did you Design?

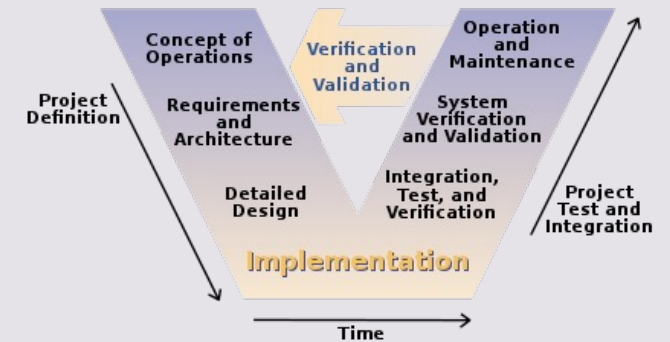
A technical system was designed to propose realistic simulations with the support of provided data and academic literature

Validation: Is your Customer Satisfied with Efficiency & Effectiveness improvements?

After several visits with assistance Coronado, he was satisfied with the overall direction and predictions for his company.

Verification: proof that your Design: Reduces Risk, Increases Performance, Reduces Cost, Reduces Time

- Forklift Reduction reduces operation risk, the simulations showed increase performance in reducing time, which consequentially reduced costs.
- Let's test a model verification now!



ABET 3, ability to communicate effectively with a range of audiences.

The team divided the tasks evenly for every member to respond to any given questions with confidence and effectiveness. The team also values honest data throughout the process to reduce any sort of miscommunication or contradictory reporting.

The team intentionally sought to communicate complex topics in a simple manner for the sake of all audiences to be engaged.

ABET 5: (ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.)

The current members of the team collaboratively created an inclusive environment that planned tasks through an SAP Activate Roadmap, and Established Goals through a collaborative spreadsheet in order to meet their objectives in a timely manner.

ABET 7 (ability to acquire
and apply new knowledge as needed,
using appropriate learning strategies.)

- Every member of the team acquired new knowledge from the other members as each member provided their own specialization in a current process of data analysis, model building, and simulation testing. This allowed all the members to constantly grow, learn, and apply new knowledge to the benefit of the project.
- For Instance, the Minitab Analyst discussed their interpretation of the given data effectively to the Facility Designer, the Facility Designer Measured the Layout effectively for the Certified SAP Tech Consultant, and the SAP Tech Consultant provided suggestions conversely to the other members.

ABET 2, ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

The team was able to utilize the design principles learned from previous courses to design a plethora of simulations and models to accurately portray ways in which to reduce RMA cycle time for our given project:

- IE 3331 ensured the students by providing the foundation of systems engineering thinking, along with presentation practice.
- IE 3332 benefited the student's understanding to constantly consider safety and hazard metrics when proposing suggestions for businesses.
- IE 3352 instructed the students on the essence of data when Designing Experiments.
- IE 4353 provided the basis for AnyLogic simulations which is the core for simulated projected data during this study.
- IE 4384 provided access & instructions to AutoCAD features to simulate the structure of this technical design.
- IE 4385 educated on control-chart balancing to detect upper-limit outliers for analysis.
- IE 4391 instructed the importance of supply chain metrics that was analyzed here.
- IE 4466 was frequently available to provide feedback on how to utilize these other courses together for a conclusive study.



Sponsors, Professors,
Teaching Assistants, and
Students.
Thank you!



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