STICKLEY AUDI & CO.

FINE FURNITURE SINCE 1900

Drawer Assembly Cell LSS Project

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Agenda

- Drawer Cell Overview
- Drawer Construction Process
- Issues Facing Drawer Cell
- Measurement Phase
- Observations
- Implemented Solutions
- Future Roadmap

Problem Statement

Output per person (drawer manufacturing) is significantly lower than the expectations. Drawers are being produced a shift in advance to keep up with the cabinet area.

Business Case

Drawer production can slow down the cabinet making process, which means that order cycle time is taking longer than it should. Increasing the efficiency of drawer assemblies by at least 15% can increase overall revenue of the company.

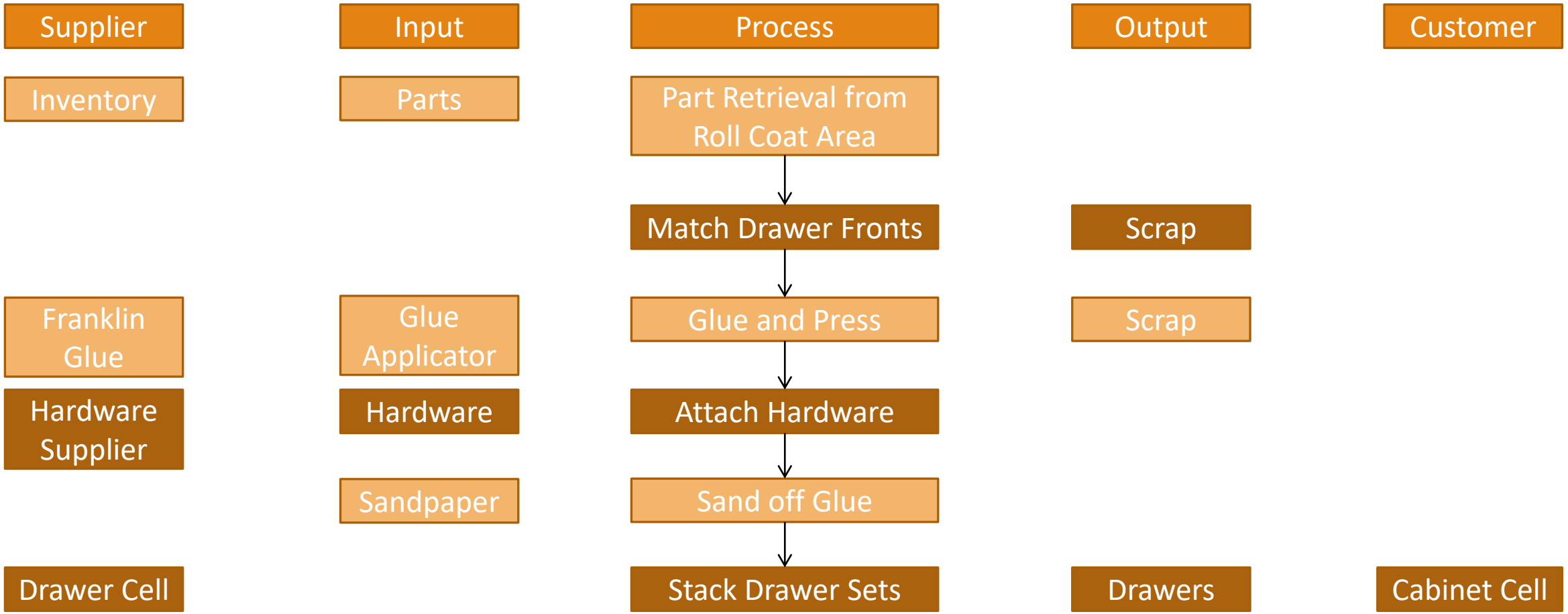
Scope

Focused on the assembly of drawers and the retrieval of drawer parts and items that assist in drawer production. No other parts of the factory are in scope.

Drawer Cell Overview

- 2 Drawer Presses
- 1 Belt Sander
- 2 workers per shift
- Parts Brought in on Roll Carts
- Adjacent to the Cabinet Assembly Area

Drawer Assembly Process



Issues Facing the Drawer Cell

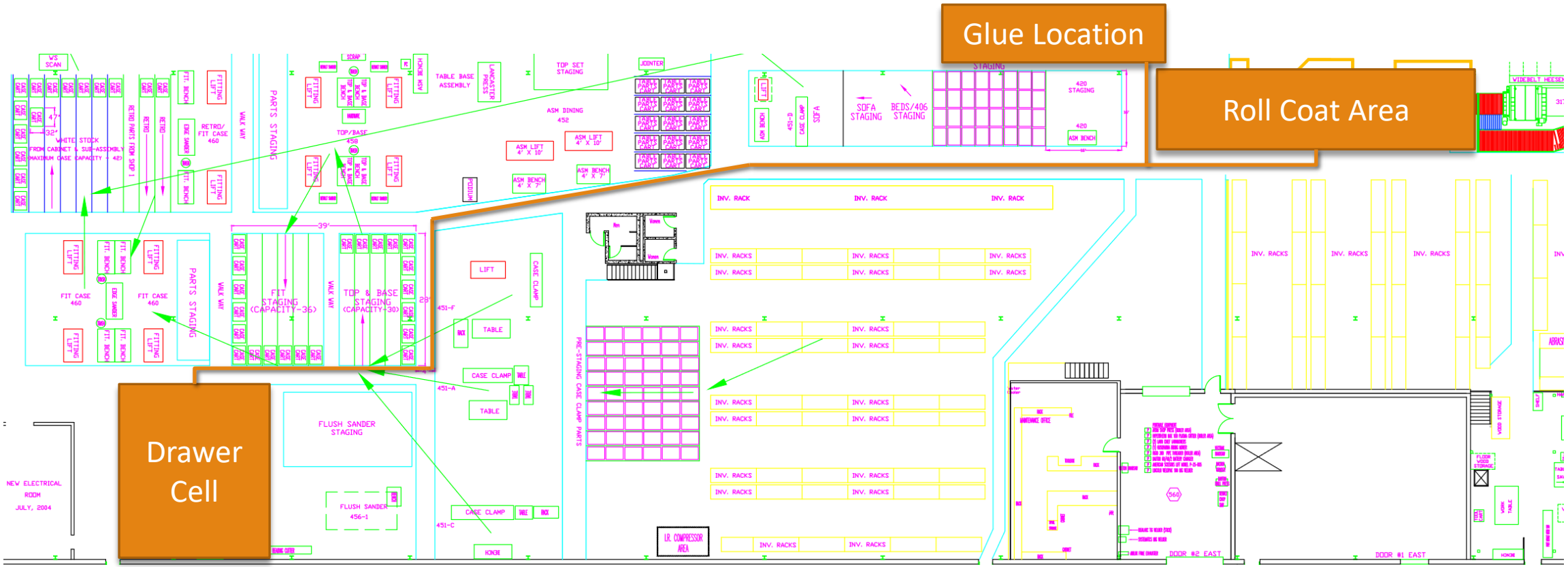
- Roll Cart Retrieval
- Glue Retrieval
- Pallet Retrieval/Movement
- Lack of Material Handlers
- Outdated Metrics used to calculate efficiencies
- Drawer Build Schedule VS Cabinet Build Schedule
- Lack of Documentation between Shift Supervisors
- Inefficient Use of Space

Glue and Pallet Retrieval

- Currently, the glue location is about a 3-minute walk from the drawer cell
- Workers use a gallon water bottle to hold the glue
- Pallets are used to move around completed drawers
- Workers must find these pallets around the factory
- Must be retrieved by Drawer Cell workers

Roll Cart Retrieval

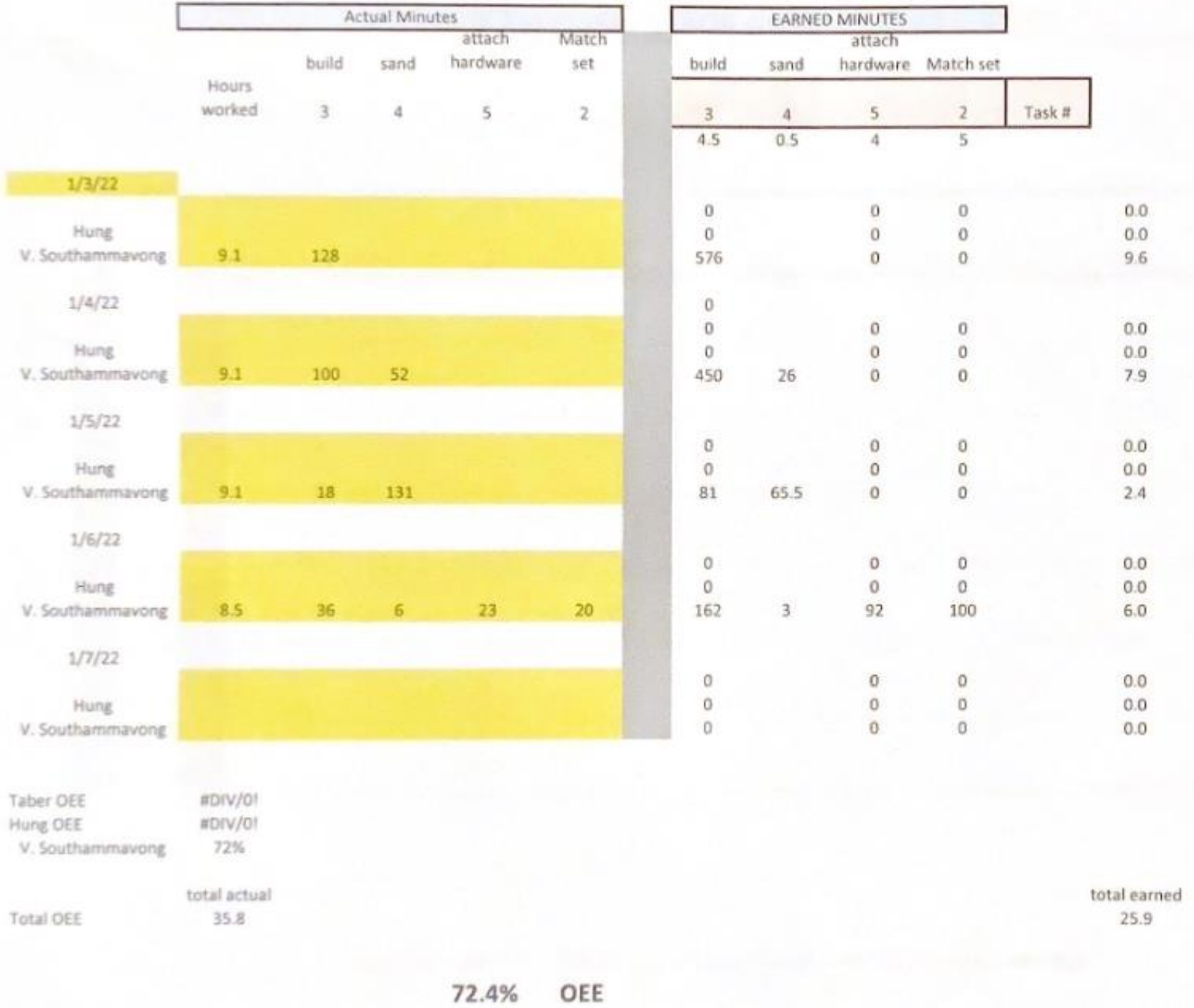
- To begin a new batch, workers must go to the roll coat area to retrieve roll carts
- Carts are labeled with Job Number
- No indication of how many carts there could be
- Workers must figure out if there are any parts in inventory
- Must be retrieved by Drawer Cell workers



Partial Factory Map

Current Metrics

- Process Efficiency is calculated using outdated timings
- Certain tasks always result in a low efficiency
- Time is taken for the entire shift, not attributed to each task



		Actual Minutes				EARNED MINUTES				
		build	sand	attach hardware	Match set	build	sand	attach hardware	Match set	
	Hours worked	3	4	5	2	3	4	5	2	Task #
						4.5	0.5	4	5	
1/3/22										
Hung						0		0	0	0.0
V. Southammavong	9.1	128				576		0	0	9.6
1/4/22						0				
Hung						0		0	0	0.0
V. Southammavong	9.1	100	52			450	26	0	0	7.9
1/5/22										
Hung						0		0	0	0.0
V. Southammavong	9.1	18	131			81	65.5	0	0	2.4
1/6/22										
Hung						0		0	0	0.0
V. Southammavong	8.5	36	6	23	20	162	3	92	100	6.0
1/7/22										
Hung						0		0	0	0.0
V. Southammavong						0		0	0	0.0

Taber OEE	#DIV/0!
Hung OEE	#DIV/0!
V. Southammavong	72%
	total actual
Total OEE	35.8

total earned 25.9

72.4% OEE

Cabinet and Drawer Cell Production Timing

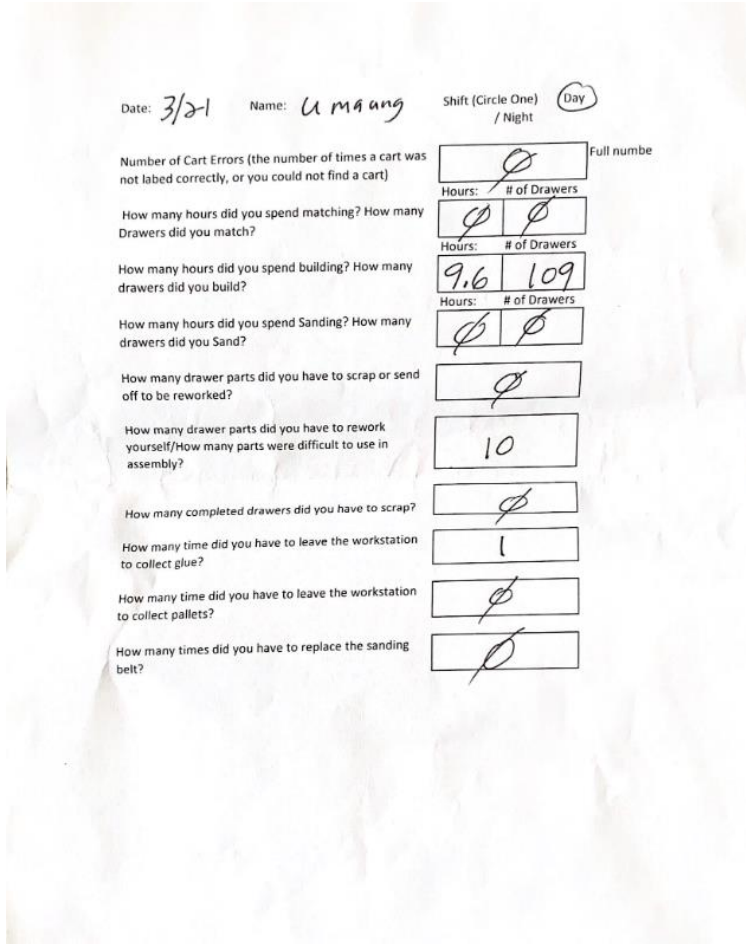
- For overall Cabinet production, the fitting process is the bottleneck
- Supervisors aim to begin drawer production for an order 1 shift in advance of drawer fit
- Many drawers waiting on factory floor
- If cabinet production runs into a problem, drawers must be scrapped
- This is the reason we are trying to reduce non-value-added time

Performance Measure	Data Location	Method of Collection	When to collect	Unit of measure	Type of data	Family of measure
Numbers of orders received	Supervisor	Order Sheet	1st Shift 2nd shift	Number of orders	Count	Productivity
Drawer part search duration	Inventory	Time put in Excel	When order received	Time	Ratio Data	Productivity
Drawer hardware search duration	Inventory	Time put in Excel	When order received	Time	Ratio Data	Productivity
Number of cart errors	Inventory	Performance sheet	On order completion	Number of errors	Count	Quality
Duration of match	Drawer Assembly	Performance sheet	On shift completion	Time	Ratio Data	Productivity
Drawer part quality	Drawer Assembly	Performance sheet	On shift completion	Number of failed parts	Count	Quality
Drawer part rework	Drawer Assembly	Performance sheet	On shift completion	Number of reworked parts	Count	Productivity
Drawer part Scrap	Drawer Assembly	Performance sheet	On shift completion	Scrap Parts	Count	Quality
Number of glue collections	Drawer Assembly	Performance sheet	On shift completion	Number of trips	Count	Productivity
Duration of glue collections	Drawer Assembly	Time put in Excel	On visit completion	Time	Ratio Data	Productivity
Duration build	Drawer Assembly	Performance sheet	On shift completion	Time	Ratio Data	Productivity
Number of pallet collections	Drawer Assembly	Performance sheet	On shift completion	Number of trips	Count	Productivity
Duration of pallet collections	Drawer Assembly	Time put in Excel	On visit completion	Time	Ratio Data	Productivity
Sanding Belt Replacements	Drawer Assembly	Performance sheet	On shift completion	Number of replacements	Count	Productivity
Duration of sanding belt replacement	Drawer Assembly	Time put in Excel	On visit completion	Time	Ratio Data	Productivity
Duration of sanding	Drawer Assembly	Performance sheet	On shift completion	Time	Ratio Data	Productivity
Drawer scrap	Drawer Assembly	Performance sheet	On shift completion	Number of drawers scraped	Count	Quality
Duration of cleaning sanding machine	Drawer Assembly	Time put in Excel	On visit completion	Time	Ratio Data	Productivity

Data Collection Plan

Measurement Methods

- Two Methods of Data Collection:
  - Performance Sheet
  - Manual Timing and Data Entry
- 360 Degree camera used to capture footage that could later be timed taken between 3/21 – 4/1
- Our timings took precedence over the time sheets



Date: 3/21 Name: U Maang Shift (Circle One) Day / Night

Number of Cart Errors (the number of times a cart was not labed correctly, or you could not find a cart)	Ø	Full numbe
How many hours did you spend matching? How many Drawers did you match?	Hours: Ø	# of Drawers Ø
How many hours did you spend building? How many drawers did you build?	Hours: 9.6	# of Drawers 109
How many hours did you spend Sanding? How many drawers did you Sand?	Hours: Ø	# of Drawers Ø
How many drawer parts did you have to scrap or send off to be reworked?	Ø	
How many drawer parts did you have to rework yourself/How many parts were difficult to use in assembly?	10	
How many completed drawers did you have to scrap?	Ø	
How many time did you have to leave the workstation to collect glue?	1	
How many time did you have to leave the workstation to collect pallets?	Ø	
How many times did you have to replace the sanding belt?	Ø	

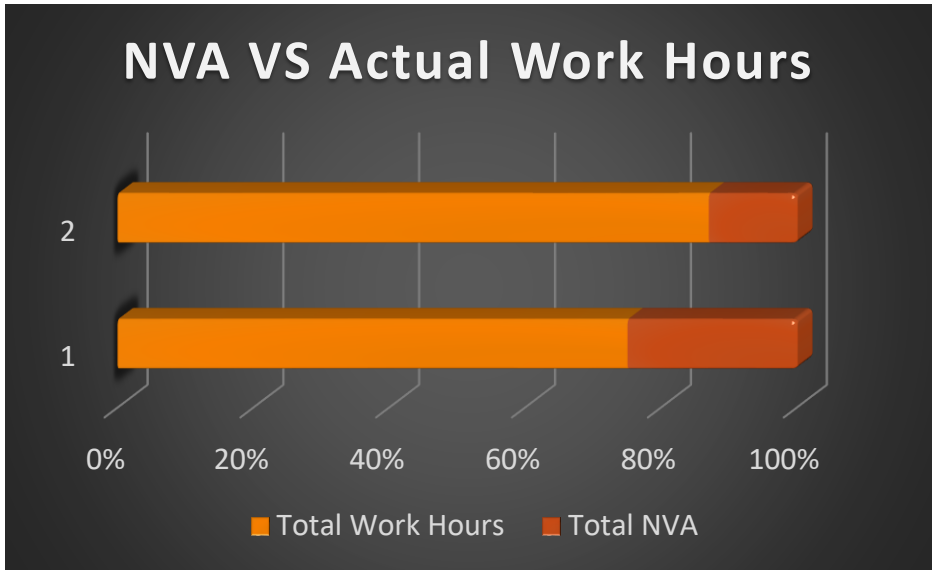
Observations

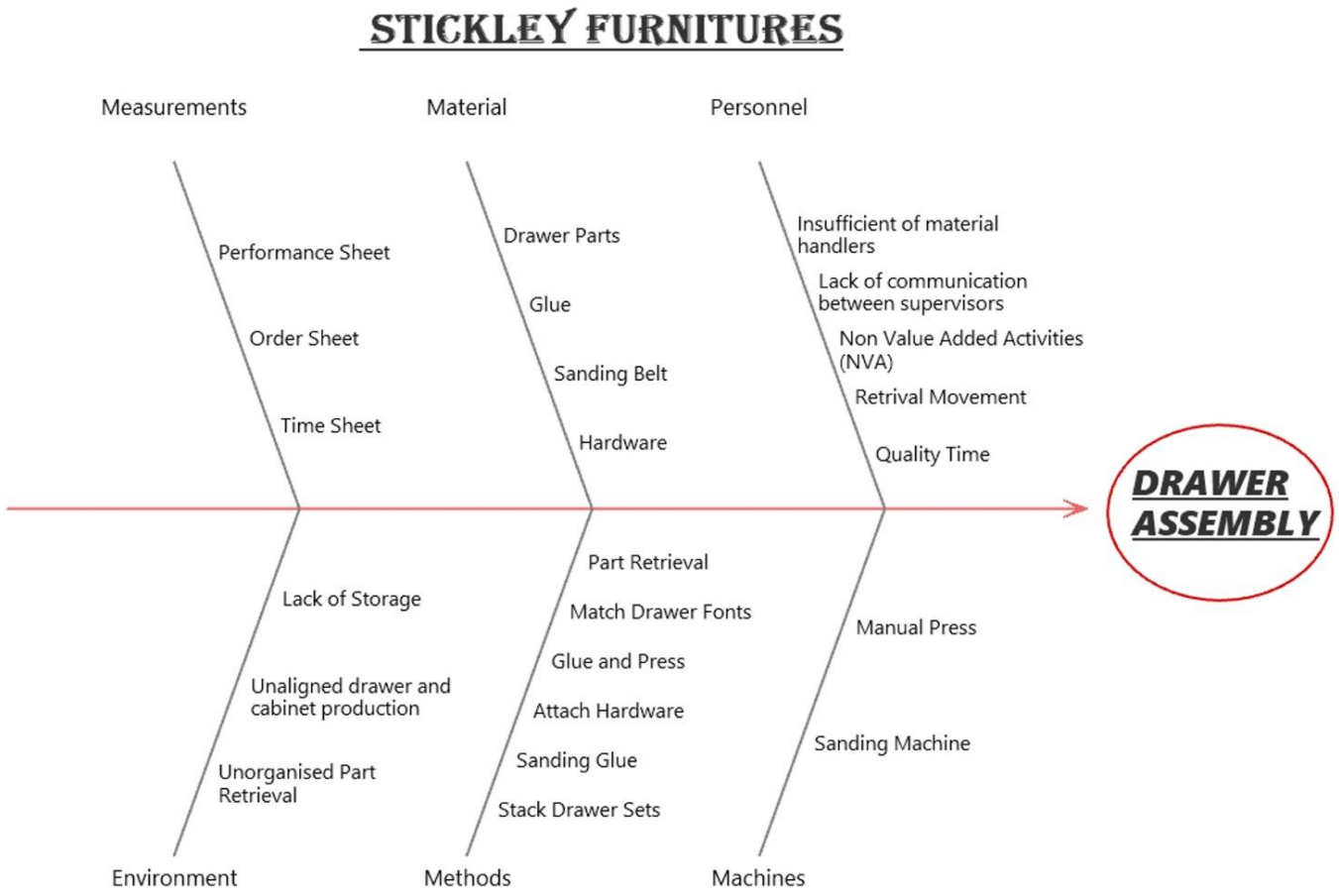
- Actual build process was efficient, and drawers were built and sanded with consistent timings
- Despite the age of the machines, they did not appear to hinder the construction of drawers
- Only times parts were scrapped regularly is when cabinets no longer need them

- We determined that about **20%** of all time spent in the drawer cell ends up being Non-Value-Added Time (NVA) These tasks include:
  - Moving pallets around the drawer and cabinet cell
  - Finding pallets to stack sets of drawers
  - Finding supervisor to address any issues in production
  - Retrieving glue
  - Retrieving roller carts
  - Construction of extra drawers
  - Cleaning off sanding machine in between sets
  - Rework or quality issues
  - Times where workers leave the station and come back with nothing

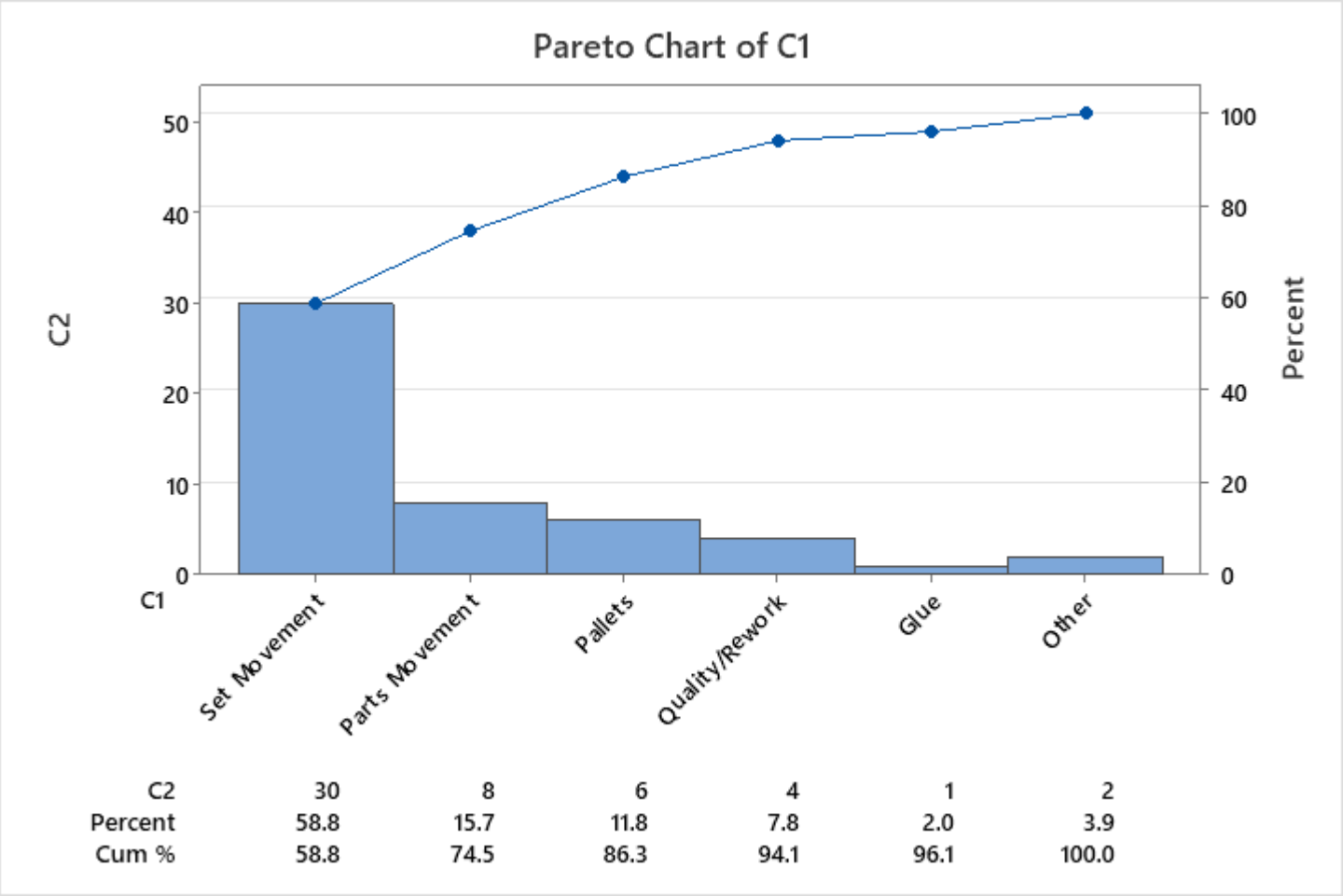
Limitations of our Observation Methods

- Lack of historical data
- Occasional lack of drawer cell activity
- Frequency of certain events (sanding belt, roll cart retrieval, glue retrieval, matching)

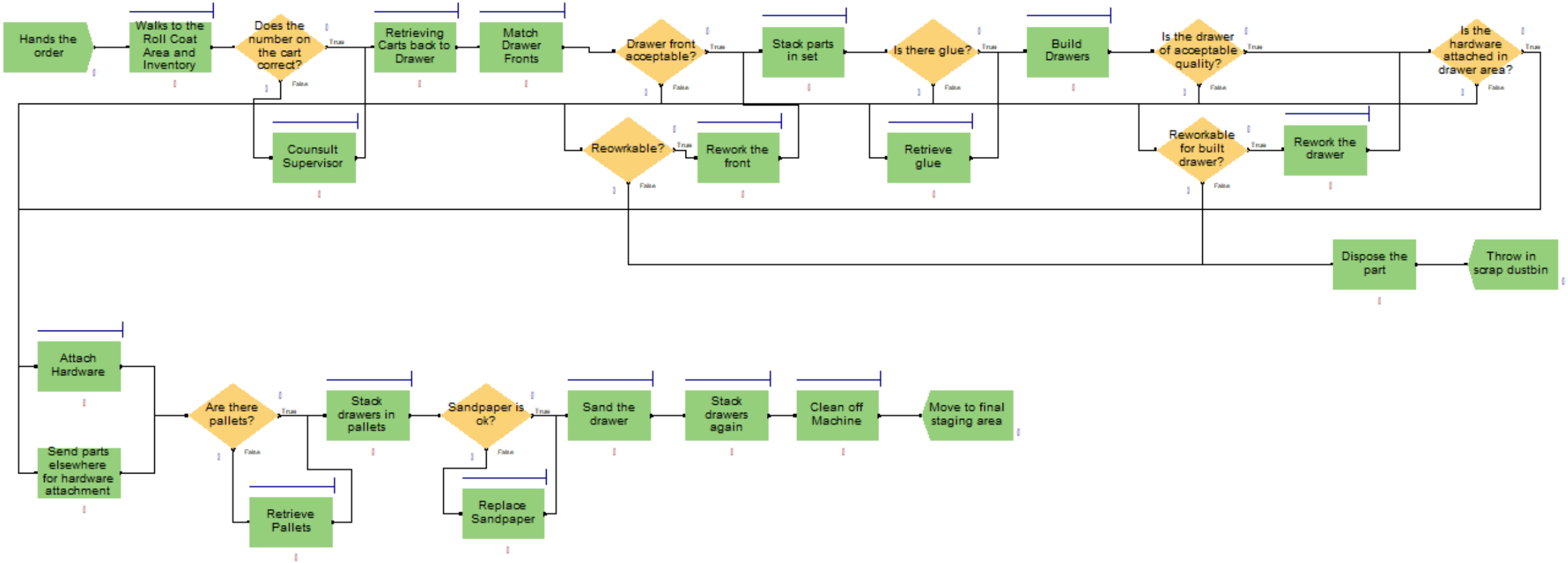




Fishbone Diagram



Pareto Chart of NVA Time

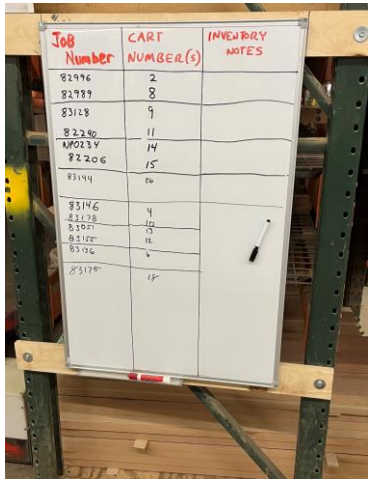


Arena Simulation

Solutions

- Pallet Handles
- Cart Labeling System
- Additional Glue Station, with bigger bottles
- Walkie-Talkies for Cell to Supervisor Communication
- Shift to Shift Communication Sheet
- More detailed time sheet
- New Performance Efficiency Sheet
- Reducing Excess Parts Stack for more space
- Establish a Pallet Collection Area

All these Improvements are focused on reducing NVA time.



Date:	Name:	Shift (Circle One) Day /Night	Job Number (If all same number, write in this box)

Number of Cart Errors (the number of times a cart was not labed correctly, or you could not find a cart)			
	Hours:	Drawers/Sets	
How many hours did you spend **Matching**? How many Drawers did you **Match**?			
	Hours:	Drawers/Sets	
How many hours did you spend **Building**? How many drawers did you **Build**?			
	Hours:	Drawers/Sets	
How many hours did you spend **Attaching Hardware**? How many drawers did you **Attach Hardware** to?			
	Hours:	Drawers/Sets	
How many hours did you spend **Sanding**? How many **drawers did you Sand**?			
How many drawer parts did you have to scrap or send off to be reworked?			
How many drawer parts did you have to rework yourself/How many parts were difficult to use in assembly?			
How many completed drawers did you have to scrap?			
How many time did you have to leave the workstation to collect glue?			
How many time did you have to leave the workstation to collect pallets?			
How many times did you have to replace the sanding belt?			

Revised Time Sheet

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Shift Communication Sheet

Date		Shift		Supervisor Name	
Status of WIP					
Issues During the Shift					
Major Problems for Focus					
Supervisor Signature					

Supervisor Communication Sheet

Process Efficiency									
Information		Task	Standard time (mins)	Actual Process Time (hours)	Actual Process Time (mins)	Standard Number of Drawers	Actual Number of Drawers	Actual Per Drawer Time	Efficiency
Shift Number	1	Sand	1.5	6.5	390	260	90	4.333333333	35%
Date	5/5/2022	Match	3.7	1	60	16.21621622	15	4	93%
Operator Name	Umang	Hardware	3.5	0.68	40.8	11.65714286	12	3.4	103%
		Build	3	9.6	576	192	109	5.28440367	57%
			#N/A		0	#N/A		#DIV/0!	#N/A
			#N/A		0	#N/A		#DIV/0!	#N/A
			#N/A		0	#N/A		#DIV/0!	#N/A
			#N/A		0	#N/A		#DIV/0!	#N/A
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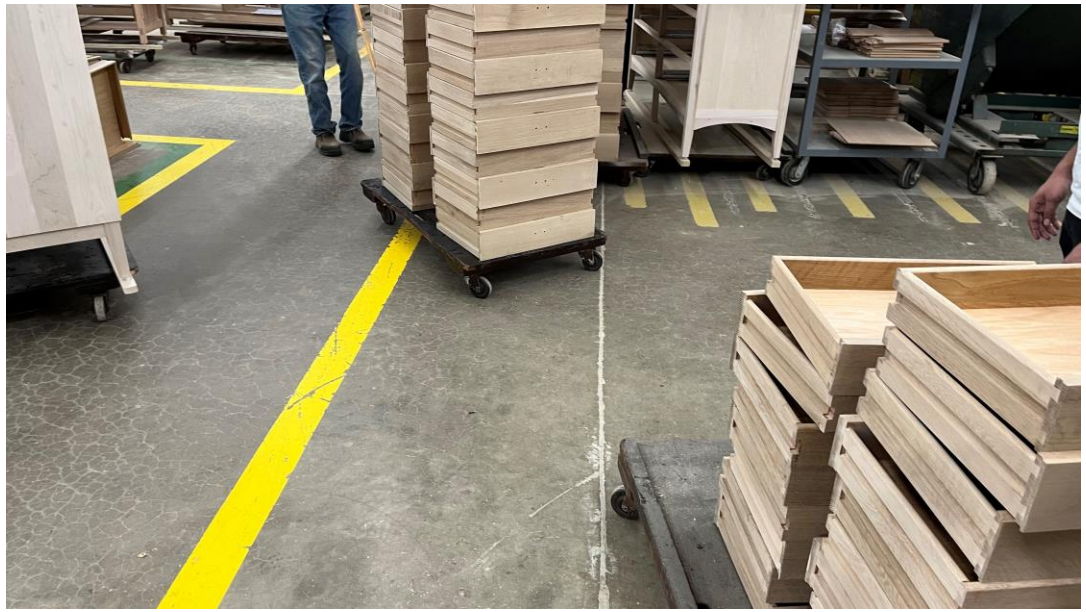
			#N/A		0	#N/A		#DIV/0!	#N/A
			#N/A		0	#N/A		#DIV/0!	#N/A
			#N/A		0	#N/A		#DIV/0!	#N/A
			#N/A		0	#N/A		#DIV/0!	#N/A
			#N/A		0	#N/A		#DIV/0!	#N/A
			#N/A		0	#N/A		#DIV/0!	#N/A

New Process Efficiency Sheet

•**Reduces** per cart retrieval time by **7 minutes**
• **Eliminates** any confusion about missing parts, which in the past took about **30 - 60 minutes** to solve



•Roughly **doubles** the speed of set movement
•**Reduces** the chance for damaged drawers during movement

Quantifying our Improvements

Future Improvements

If non-value time decreases next steps are:

- Redesign of pallets to be drawer specific
- Hire more material handlers
- Time study of drawer and cabinet production
- Establish a communication system between the cells using a whiteboard
- Implement Four-Shift software into each production cell for even better communication and tracking
- Apply what we have learned to other parts of the factory

Thank you!

Questions?

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