Optimizing Port Processes to Solve Supply Chain Complications

ME 635/IPD 611

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Our goal is to identify shortcomings in the operations of The Port of Los Angeles that can be fixed in order to improve throughput.

Background

Various combined complications of the post-COVID-19 pandemic world has created a perfect storm for supply chain problems. Transportation costs, carrier capacity, customer/industry demand and workforce fluctuations has caused crippling delays in the manufacturing and supply of goods into and out of the country.

A big mover in global transportation is the fluctuations in oil and gas prices.

The sudden increased demand for fuel as the world begins to travel more after the end of the pandemic has caused a heightened demand that suppliers have not been able to meet.

The west's stockpile of oil and gas is quickly diminishing. OPEC and Russia have shown hesitancy to ramp up supply over fears of losing price stability. What this means for the supply chain is that prices will remain high for the foreseeable future.

The volume of customer demands for online shopping keeps growing. Even before the pandemic, the number were accelerating at a rate of 25 percent. This challenges many DCs as they are drawing workers from a limited labor pool. Therefore, the supply of goods still cannot meet the demand, resulting in the upcoming shortages.

Background

Workforce labor mismatches have hit all sectors of the economy, but are especially affecting the supply chain. Long term structural shifts as well as short term pandemic shifts have caused compounding effects. The pandemic has caused people to relocate, to retire at unexpectedly low ages, and to seek employment in different fields, lowering the workforce. Because the transportation workforce has shrunk and the demand has increased, wages for the transportation workforce have seen 4x jumps. Labor shortages and increased costs of fuel has transportation logistics becoming less profitable.

Ports, like many engineer problems, operate on a very simple conservation principle. Cargo that enters the port to be processed must also be shipped away.

Trucking companies even before the pandemic have had issues being profitable year round across seasonal demand shifts.

Rising oil prices and a diminishing trucker workforce has severely limited ports' capacites. This issue is partly the reason why there is such a backup.

With these various complications in the supply chain, identifying time reducing measures has become more crucial than ever.

Improvements in port operations can help offset these newfound challenges.

Modeling to identify operational shortcomings can help to solve both incoming and outgoing complications.

The model will establish a baseline sequence of operations that The Port of Los Angeles currently uses. Various changes, such as shift times, equipment utilization, truck queues and schedule management will be adjusted systematically in order to identify weaknesses in the system.

The emphasis of the simulation is to find ways to more efficiently process incoming cargo and to more efficiently handle trucking queues.

Phase 1 - Alpha Prototype - Progress Report

- Model incoming cargo carrier processes
- Model port processing process
- Model outgoing throughput

Phase 2 - Beta Prototype - Final Report

- After establishing a model of the existing port operations, finetune variables to find areas for improvement.

Arena will be used to determine the effectiveness of:
1. Increasing port operating hours
2. Increasing port staff
3. Increasing the number of intermodal truckers
4. Adding more trains vs adding more train cars

Excel will be used to predict trends in import volume.

MatLAB can also be used to combine the various factors to output and visualize data.

Resources

"Shippers and Carriers Respond." *The Top Supply Chain Challenges in 2021*, 10 Jan. 2022, https://resources.coyote.com/source/supply-chain-challenges.

Leonhardt, Megan. "Https://Fortune.com/2021/12/16/Supply-Chain-Problems-55-Percent-People-Blame-Government/." *Fortune*, 16 Dec. 2021, https://fortune.com/2021/12/16/supply-chain-problems-55-percent-people-blame-government/.

Bhattacharjee, Dilip, et al. "Navigating the Labor Mismatch in US Logistics and Supply Chains." *McKinsey & Company*, McKinsey & Company, 14 Dec. 2021, https://www.mckinsey.com/business-functions/operations/our-insights/navigating-the-labor-mismatch-in-us-logistics-and-supply-chains.

Collins, Jeff. "The next Kink in the Supply Chain: Warehouses." *Orange County Register*, Orange County Register, 9 Nov. 2021, https://www.ocregister.com/2021/11/08/the-next-kink-in-the-supply-chain-warehouses/.

https://www.portoflosangeles.org/

Resources - Gantt Chart

Optimizing Port Processes to Solve Supply Chain Complications

Company Name
Project Lead

Project Start: Tue, 2/22/2022

Display Week: 1

Feb 21, 2022

TASK	ASSIGNED TO	PROGRESS	START	END	21 M	22 T	23 W	24 T	25 F	26 S	27 S
Phase 1 - Progress Report											
Discovering Port Processing Operation	Jesse, Peera	0%	2/22/22	3/8/22		██	██	██	██	██	██
Dissovering Truck Shipping Operations	Tyler, Marlon	0%	2/22/22	3/8/22		██	██	██	██	██	██
Modeling Port Operations Alpha Build	Team	0%	3/8/22	3/22/22							
Building Report	Team	0%	2/22/22	3/22/22		██	██	██	██	██	██
Phase 2 - Final Report											
Changing Variable Parameters	Team	0%	3/22/22	4/12/22							
Optimizing Model	Team	0%	3/22/22	4/12/22							
Building Report	Team	0%	4/12/22	5/3/22							