

Freight Cost Reduction Project

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Abstract — *Shipping products from the Caribbean have a limited amount of freight options in comparison with other geographical regions. For HPE Puerto Rico, one of the main business goals for FY23 is to establish initiatives that can help reduce freight costs. This task was achieved using the DMAIC methodology and the use of lean six sigma tools, like the failure mode and effect analysis. By using these tools process governance was established, the projected average cost per pound will be reduced by 33% and the shipping process was improved. The implementation of all these initiatives resulted in a potential cost savings of \$180K for FY23 and other process improvements.*

Key Terms — *DMAIC, Freight cost reduction, Lean Six Sigma, Outbound*

INTRODUCTION

HPE Puerto Rico’s Manufacturing Operations (HPEPR) incur freight costs to ship finished goods to its destinations. As HPEPR is located on an island in the Caribbean, freight options are limited compared to other HPE sites. For HPEPR, one of the main business goals for FY22 is to establish cost-reduction initiatives across the organization. This initiative was selected by the Supply Chain Department as it directly impacts the cost of sale (COS) of HPEPR’s businesses.

For HPEPR, the difficulty with the process is that freight charges are reported by the Traffic Department as a lump sum figure and there is not enough granularity available for the supply chain department to identify areas of opportunities. This causes some difficulty to present a clear picture to top management of how freight charges are behaving and where to establish process improvement plans.

The objectives of this project were to:

- Reduce HPEPR Freight Cost Per Pound
- Optimize total outbound spending.
- Improve historical data reporting methodology.

LITERATURE REVIEW

One of the most critical objectives for a manufacturing company is to deliver its goods on schedule. Compliance with deliveries helps increase the brand's reputation and significantly influences consumer satisfaction. To meet the commitment date, organizations must standardize their outbound procedures to provide an accurate service to their customers. To achieve these improvements, different methodologies can be applied and one of the most useful is lean six sigma. “Lean six sigma improvement initiatives have been deployed across numerous industries ranging from industrial products to retail chains and food distribution to increase supply chain productivity. They include reductions in direct and indirect labor; improvements in order accuracy, on-time delivery, and inventory turns; and reductions of premium freight charges, excess and obsolete inventory, inventory shortages, and returned goods” [1].

The Lean Six Sigma team methodology verifies the current performance baseline and determines the primary causes of poor performance. It also provides significant improvements in a company by enhancing the supply chain and reducing logistics expenditures [2].

ANALYSIS

Define Phase

“Before initiating any process improvement project, a business needs to determine the characteristics of the product or service that are critical to quality as judged by customers – this is

known as a critical to quality tree” [3]. The creation of a critical to-quality tree shown in Table 1 helped precisely determine the client's need and specifically what needs to be addressed.

Table 1
Critical to Quality Tree

Need (What does the customer need?)	Driver (Hard to measure)	Critical to Quality Characteristics (Easy to measure)	Data Source
Reduced Freight Cost per Pound	Optimized Carrier Usage	Low cost per pound by carrier	Trax Report
	Optimized business	Low cost per pound by business and controlled usage of expediting services	

To achieve the goal, optimization of carriers was identified to predict which carrier is more suitable for every business need. Not every business in the organization manages the shipments in the same way. As an example, one of the businesses can have shipments with a low amount of weight but with a high volume while others can operate with a small number of shipments but with a higher weight amount. This consideration is a key element in optimizing the process and finding what is the best for every business need.

The Critical to Quality Tree also provided the visibility of identifying what will be the data source for the analysis. Particularly in HPPR, the freight data source is called “Trax report” and is provided by the Logistics Team. This report is a breakdown of the invoices or shipping costs and the amount of pounds shipped in a single month. From this report, the cost per pound can be calculated by dividing the shipping cost by its weight in pounds.

“Nothing works better than cost-per-pound data to help identify areas to lower costs, provide a benchmark for years to come, and hold freight carriers accountable. Having this data is also

imperative when putting serious muscle into any supply chain.” [4].

As it is shown in Figure 1, a process map was developed of the Outbound Freight Management Process to have end-to-end visibility. This helps identify areas of opportunities for process improvement.

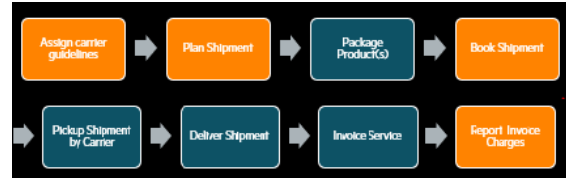


Figure 1
Outbound Freight Management Process

Measure Phase

With all these suspicions highlighted in the define phase, several charts were created to have a better understanding of the current situation. On Figure 2 a line chart was developed to identify the cost per pound associated with carriers. Based on this chart, Carrier 1 or C1 provided the lowest cost-per-pound rates across all fiscal year 21. Top carriers have been renamed to C1 and C2 due to confidentiality purposes.

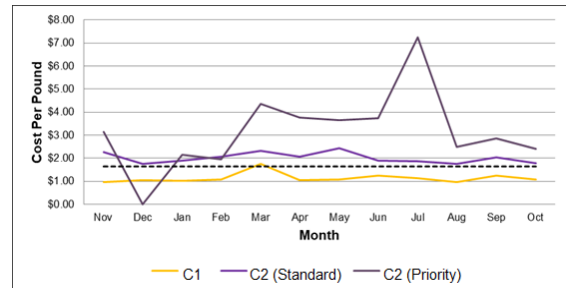


Figure 2
HPEPR Cost Per Pound by Carrier Type FY21

Figure 3 was developed to have more specific information about the shipment behavior of different businesses and their respective cost per pound. This provided visibility of the business with highest percentage of shipped pounds and with a greater possibility for cost reductions. Top Business has been re-named from B1 to B7 due to confidentiality purposes.

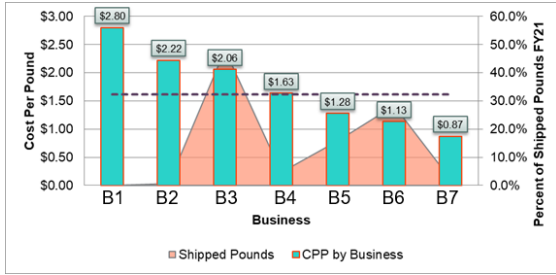


Figure 3
Cost Per Pound by Business vs Percentage of Pounds Shipped

Analyze Phase

For the analysis phase, a cause-and-effect diagram was conducted to identify the potential root causes driving high freight costs. The cause-and-effect diagram might be confused with the fishbone diagram, but the main difference relies on the fishbone diagram categorizing the problems in one of the following causes: man, machine, material, or method [5]. The standard cause and effect diagram provides a clear view of the actions/cause, and the consequence (the thing that happened because of it) that is the effect.

In Figure 4 it can be seen the cause-and-effect diagram develop to determine more specific root causes:

- Lack of freight management strategy
- High utilization of priority shipments
- Lack of packaging strategy
- Invoicing process gap

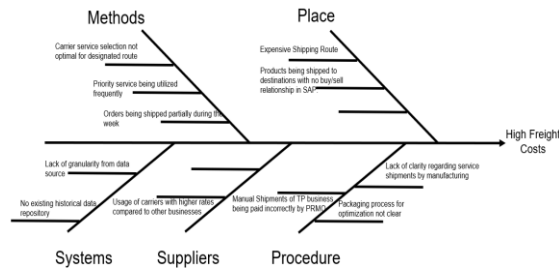


Figure 4
Cause and Effect Diagram

Root cause identification helps understand what happened in the past but to have a better understanding of what can happen in the future a creation of a failure modes and effects analysis should be conducted. On Figure 5 is shown the FMEA developed for process assessment.

Process Step	Potential Failure Mode	Potential Failure Effects	SEV	Potential Causes	OCC	Current Process Controls	DET	RPN
Assign Carrier usage Guidelines	Assignment of carrier guidelines are not executed	Maintain existing service level agreements	6	Carrier SFC not executed by Traffic department	3	Governance process by Traffic department	3	54
	Communication of negotiation results doesn't reach key personnel	Continue to utilize carriers with higher rates.	9	Results communicated via email may not reach all key personnel.	6	No controls in effect	6	324
Plan Shipment	Ship product as priority when there was no need to.	Business impacted will pay a higher cost for freight	6	*Un-clear guideline of service usage *Lack of management governance	6	No controls in effect	6	216
	Plan incorrect amount of units to ship	Customer receives incorrect amount of units.	9	Ship Plan Order created incorrectly	3	Plan orders are automatically generated from Sales Orders in SAP	3	81
Book Shipment	Assign incorrect carrier service for designated routes	Ship product using a carrier with a higher cost per pound.	6	Planner and CEVA not aligned on shipment strategy per business.	6	Verbal agreement on which carrier to use.	6	216
	Use incorrect invoicing billing account	Charges will hit incorrect business.	6	*Account field left blank in shipping documentation. *Lack of process knowledge by new planning resources. *Process Oversight by Logistics team.	6	Physical validation by shipping coordinator.	6	216

Figure 5
Failure Modes and Effects Analysis

Process steps with the highest risk priority numbers were:

- Assign Carrier Guidelines
- Plan Shipment
- Book Shipment

The analysis showed that there is no formal process to document freight strategies, that there is no governance in place to track priority shipments, and that there is a process gap in the utilization of shipping accounts.

Improvement Phase

The improvement phase was about the creation of a series of actions defined to improve the freight management process. In Figure 6 it can be seen a revised FMEA with all the actions taken to improve the process and the new risk priority numbers that will result after the implementation of the suggested actions.

Process Step	Potential Failure Mode	RPN	Actions Recommended	Responsibility (Target Date)	Actions Taken	New SEV	New OCC	New DET	New RPN
Assign Carrier usage Guidelines	Communication of negotiation results doesn't reach key personnel.	324	Execute freight cost reduction initiative Program to establish strategies prior to the next fiscal year commencing and monitor & control through the year.	10/20/2022	Freight Management Program Created.	9	3	6	162
Plan Shipment	Ship product as priority when there was no need to.	214	*Establish governance that priority service can only be used when there is a revenue impact. *Create Priority shipment tracking file and upload to Supply Chain SharePoint so management can keep track of shipments.	10/21/2022	Governance process established. SharePoint Created.	6	3	3	54
	Assign incorrect carrier service for designated route.	214	Create procedure and upload to Master Central Quality Tool documenting guideline on which shipping accounts to be used by business. This procedure will be followed by planning coordinators and Logistics team (CEVA).	10/14/2022	Procedure created and submitted in Master Control. CEVA to reference in their shipping guidelines.	9	3	6	162
Book Shipment	Use incorrect tracking billing account	214	*Establish governance that priority service can only be used when there is a revenue impact. *Create Priority shipment tracking file and upload to Supply Chain SharePoint so management can keep track of shipments.	10/21/2022	Governance process established. SharePoint Created.	6	3	3	54

Figure 6
Action planning for process improvement

For better visibility Table 2 was created to demonstrate a comparison of how the conditions were at the initial state and how they will change after the implementation.

Table 2
Summary of Improvements

Before	After (Including the benefits)
Cost per pound available at site level	Cost per pound is available at a business level, region, and service type. Data collection system in place to monitor trends
No effective data trend history in place	Data collection system in place to monitor trends and identify process improvement opportunities
Unclear freight strategies	A freight management program was created to identify key areas of opportunities and monitor/control initiatives
No governance of carrier priority service utilization	Governance process was put in effect with SharePoint to track the usage of priority shipments and a passive approval process created
Gap in shipping account usage guideline	A process created and documented in the quality system site to help guide employees on which shipping accounts should be used by business

Control Phase

To sustain the gain, several steps were taken to maintain improvement:

- Documentation: Project documentation is stored in Freight Management Share drive.
- Communication: Changes in process communicated to impacted parties (Logistics team, procurement team, planning team).
- Training: Planner coordinators trained on procedure created regarding correct shipping account usage.
- Monitoring: Historical tracking of the cost per pound. Monthly status meetings are in place with management to monitor the progress of initiatives, trends, and areas of opportunity. Cost per Pound is being tracked at the site scorecard level to give visibility to top-level management to drive management support/involvement.

RESULTS

All the objectives were achieved due to:

- Establishment of carrier guidelines specific and optimal for every business. This will reduce cost per pound from an average of \$1.62 to a projected \$1.08. A 33% cost per pound reduction and a total projected saving of \$180K for FY23
- Optimization of outbound spending by requiring priority shipments to be authorized by top management.
- Improvement of historical data reporting by creating a data collection system in place to monitor trends.

CONCLUSION

Lean six sigma methodology offers great flexibility in terms of all the scenarios it can be applied. From small manufacturing issues to problems that have high management visibility like the cost per pound metric. By implementing this methodology several improvements were quickly identified and assessed. As a result of this project, the freight management process will now be more robust while also achieving cost-reduction benefits.

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