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Executive Summary

The following project is done with a Hypothetical company (Star E-commerce solution Company).

Star E-commerce is a last mile delivery provider for an e-commerce company which has initiated the project to improve the efficiency of on-time delivery to its customers. The current level of service is 88.8% and target setup is to bring to 98%. On-time delivery to customers is an important KPI metric to understand the efficiency of the fulfilment centre performance.

Business Problem:

When an order is placed, Star E-commerce Co. operates a fulfilment centre (warehouse) that supplies various shipments to the end customers from its centre. On-time shipments (OTD) at the fulfilment centre are essential to sustaining mass service and final-customer sales. It is also essential for future growth. An examination of the previous year's deliveries reveals that the OTD percent is at 88.8 percent, resulting in production and sales losses at the e-commerce platform. The goal of this project is to raise the OTD percentage to the levels required by the e-commerce company.

Brief background of Last mile delivery in supply chain:

The movement of commodities from a hub to final destinations is referred to as last-mile delivery in supply chain nodes. This study proposes a decision-making technique for the execution of last-mile delivery activities in a supply chain. Decision-makers in all industries, from manufacturing to services, must deal with the consequences of previous and current decisions that affect their supply chain on a daily basis. The actions associated to the flow and transformation of products or services in a certain market or business indicate the outcomes of decisions and their repercussions. So far, academics and practitioners have agreed on the notion of supply chain management that last mile is the costliest nodes in supply chain.

Statistical Problem

At present OTD% is 88.8% that is gathered from the last 1 year's data. The Target figure of OTD% is to raise it to 98% by implementation of six sigma tools. This will be analysed by DMAIC method of Six Sigma.

1. Define

SIPOC diagram for defining the on-time delivery shortcomings

S	I	P	O	C
Suppliers	Input	Processes	Output	Customers
From various vendors	Demand forecast	Logistics Capacity, planning Warehousing	Capacity to meet demand & OTD	Final end users
Supply of Various items	On time supply of various items	Keep sufficient inventory in warehouse	To meet service levels	Final end users
Direct from factory	Delivery schedules	Sorting, packing dispatch	Deliveries in smaller trucks	To customers
Drivers	Delivery schedules, documents, Gate Pass	Load items on truck & upload documents	FTL, LTL	To scheduled customers

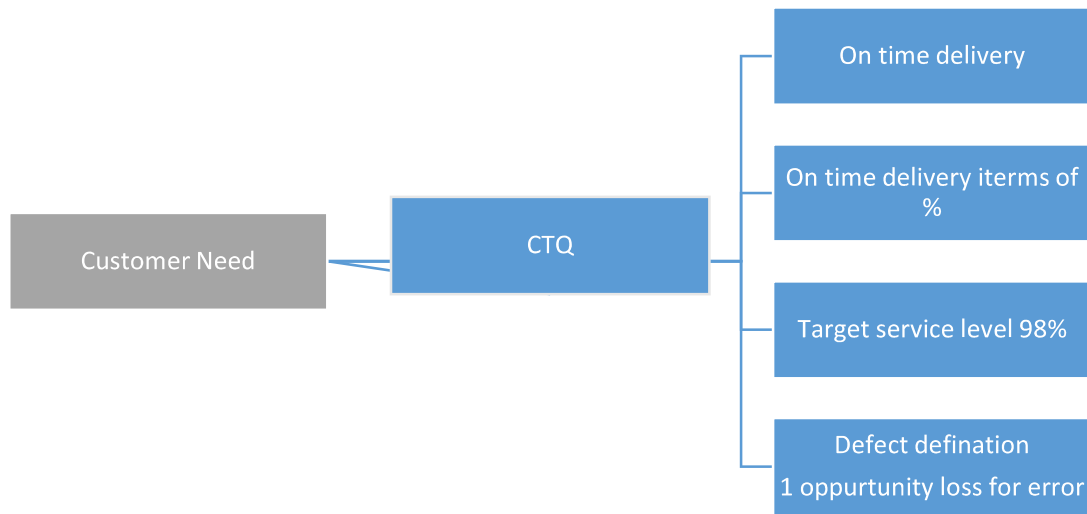
Identification of stakeholders & VOICE

Stakeholders	Who	Voice
Customers	Last delivery address	Eliminate Losses due to late delivery
Driver coordinators	Fulfilment centre	Require accurate delivery schedule
Drivers	Fulfilment centre	Schedule, Location of trucks
Supplier of components	Suppliers/Vendors	Forecast & stock levels
Shipping personnel	Warehouse	Details of personnel, contact numbers



VOICE: Improve on time deliveries

Identification by CTQ (Critical to quality tree structure)



2.Measure

Data collection plan (What to measure)

KPI	Data Type	Definition	How to measure	Data source
Total deliveries	Discrete	Number of total deliveries/days	From invoice (counts)	Delivery report
On time deliveries	Discrete	On time deliveries/day	From invoice (counts)	Delivery report
OTD%	Continuous	OTD/Total deliveries (%)	(Number of on-time deliveries per day / Total number of deliveries per day) x 100	Delivery report

Sampling

All deliveries from Jan-20 to Dec -20

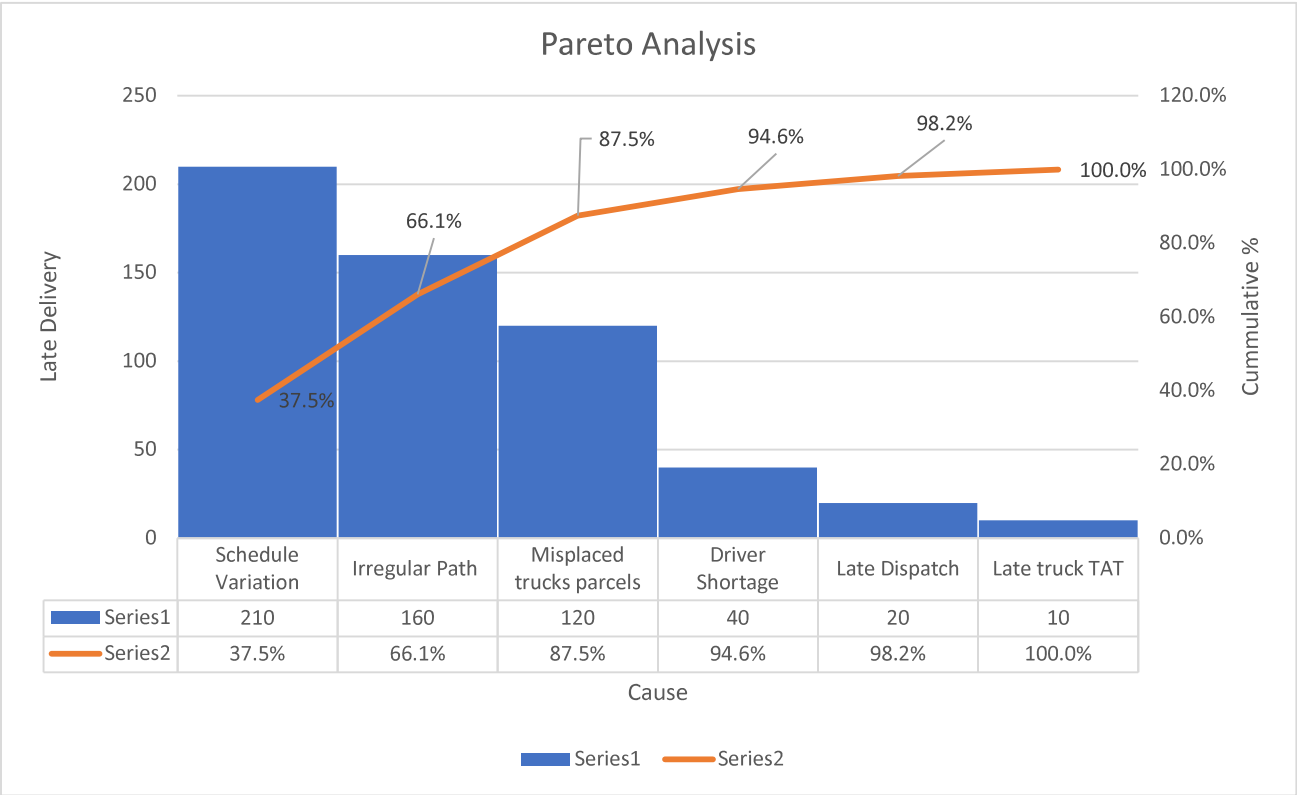
Baseline performance

Date	Total deliveries	On time delivery	OTD%	Late delivery defects
From Jan 2020 to Dec 2020 (1 Year data)	5000	4440	88.8%	560

Baseline DPMO & Sigma Level

Process	Defects	Units	Opportunities/unit	Total opportunity	DPU	DPO	DPMO	Sigma LT	Process shift	Sigma ST
OTD	560	5000	1	5000	.112	.112	112000	1.3	1.5	2.8

3.Analyse Phase

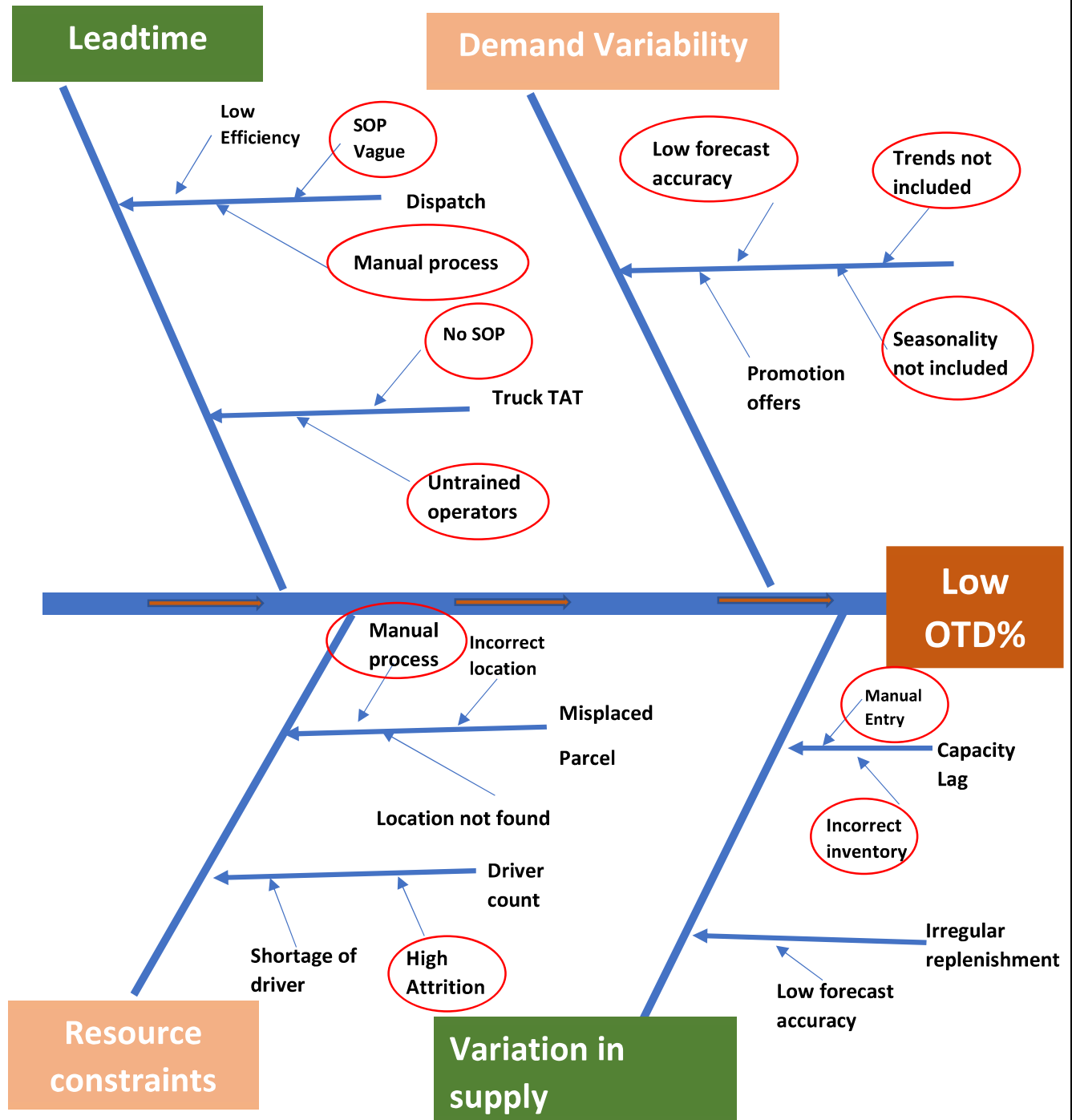


After plotting the Pareto chart with requisite data, it was quite evident that 87.5% of the delay on time delivery was due to the fact of 3 major reasons.

- 1.Variation in schedule
- 2.Irregular Path
- 3.Maipplaced truck parcels.

Fishbone Diagram

Going deeper let us make a root cause analysis (RCA) with fish bone diagram.



From the fish bone diagram, we found following factors that are contributing for OTD rates.

Sr. No	Factors (X)
1	Low forecast accuracy
2	Market trends
3	Seasonality trends
4	Manual Process
5	Lack of SOP
6	Driver Shortage
7	Misplaced Parcel
8	Inventory Incorrect for the parcels
9	Untrained operators

4.Improve

S. No.	Cause	Improvement actions	Responsible	Target date
1	Low forecast accuracy	1.Regular monitor of forecast accuracy 2.Use latest data analytics to predict 3.Review the forecast on aggregate levels. 4.Improve S&OP	Demand Planner	03-Jun-20
2	Market trends	1.Improve S&OP 2. Knowledge of fluctuation of demand 3.Use historical data	Demand Planner	25-May-20
3	Seasonality trends	1.Improve S&OP 2.Create Dashboard	Demand Planner	15-Jun-20
4	Manual Process	1.Hire 3 rd party vendor for automation process as much as possible	Warehouse manager	10-Aug-20
5	Lack of SOP	1.Precise SOP 2.Work Flow streamline	Warehouse manager	10-Jun-20
6	Driver Shortage	1.Re-training 2.Redvelop hiring policy	Logistics Manager	15-Jun-20
7	Misplaced Parcel	1.RFID on parcel 2.GPS on trucks 3.Integrate with WMS	Warehouse manager/ IT	10-Aug-20
8	Inventory Incorrect for the parcels	1.3 rd party vendor for automated inventory management 2.Same time develop inhouse automated /integrated WMS	Warehouse manager/IT	30-Jun-20

9	Untrained operators (Delivery man)	1.Training method enhance 2.More of visual and simulation based 3.Practical hands-on training increase from 15 to 20 days.	Warehouse manager/ HR	04-Jul-20
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Estimated Budget allocated for Improvement & ROI

Project Investments 2 Cr (Approx.)

WMS Automation

GPS

Training

SOP, Others

Project Savings (1 Year Estimate) 6 Cr(approx.)

Increased revenues

Increase Process efficiency

Avoidable cost (Marketing etc.)

Net Savings 4 Cr (Approx.)

5.Control Plan

In order to improve the on-time deliveries, the following control plan table is set up. It accounts for all the factors against control method & reaction plan.

Control Factor	Measure Technique	Sample size	Sample frequency	Control method	Reaction plan
Forecast Accuracy	MAD (Mean Absolute Deviation)	100%	Monthly	Signal tracking	1.Review models of forecasting 2.Alert the users
Inventory Levels	Inventory record accuracy %	100%	6-Monthly	ABC classification	Correct old records
Driver Availability	Integrated Dashboard	100%	Daily	WMS dashboard	Driver count optimization
Truck location	Audit	5%	Daily	GPS systems	Route optimization
Dispatch Time	1.WMS Dashboard 2.Send notification	100%	Daily	WMS	Review the progress

Results Before Project

Date	Total deliveries	On time delivery	OTD%	Late delivery defects
From Jan 2020 to Dec 2020 (1 Year data)	5000	4440	88.8%	560

After Project

Date	Total deliveries	On time delivery	OTD%	Late delivery defects
From 12-Aug- 2020 to 11-Sept- 2020 (1 Month evaluation)	1500	1472	98.1%	28

Before Project (Baseline Calculations)

Process	Defects	Units	Opportunities/unit	Total opportunity	DPU	DPO	DPMO	Sigma LT	Process shift	Sigma ST
OTD	560	5000	1	5000	.112	.112	112000	1.3	1.5	2.8

After Project (Baseline Calculations)

Process	Defects	Units	Opportunities/unit	Total opportunity	DPU	DPO	DPMO	Sigma LT	Process shift	Sigma ST
OTD	28	1500	1	1500	.0186	.0186	18667	2.1	1.5	3.6

Statistical Solution

The root-causes of the low OTD% was due to high variation in demand, high variation in delivery from vendors to warehouse, inefficiency & inaccurate stock levels at warehouse due to manual processes, lack of standard practices, driver shortage, long lead-times.

Improvement actions taken are – Improved S&OP maturity by planning & forecasting, increased efficiency and accurate stock levels through process automation (WMS) & training, process standardization, optimized driver count/best practices to recruit and retain drivers, optimized lead-times by using standard processes & training.

Business Solution

OTD% has increased to 98.1% vs. the target of 98%, based on the pilot run. With the target to achieve 98% on-time delivery by considering process optimization, automation & cost avoidance the project was a successful by the end customers and the stake holders.

There shall be every effort to sustain the improvements.