

MINIMIZING NON-COMPLIANT INCENTIVES VIA INTELLIGENT LOGISTIC COMPLIANCE TERM (LCT) OPTIMIZATION



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IE3100R Systems Design Project - Group 20B
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1 PROBLEM OVERVIEW

PROBLEM DESCRIPTION

At P&G, **Logistic Compliance Terms (LCT)** are designed to encourage effective customer ordering behaviours.

However, frequent non-compliance with these agreements has resulted in **delivery inefficiencies**, highlighting the need for improvements.

To safeguard logistics performance and ensure discounts are **meaningfully awarded**, it is critical to **track compliance accurately** and **optimize these LCT** for long-term operational effectiveness.

STAKEHOLDER ENGAGEMENT



2 OBJECTIVES

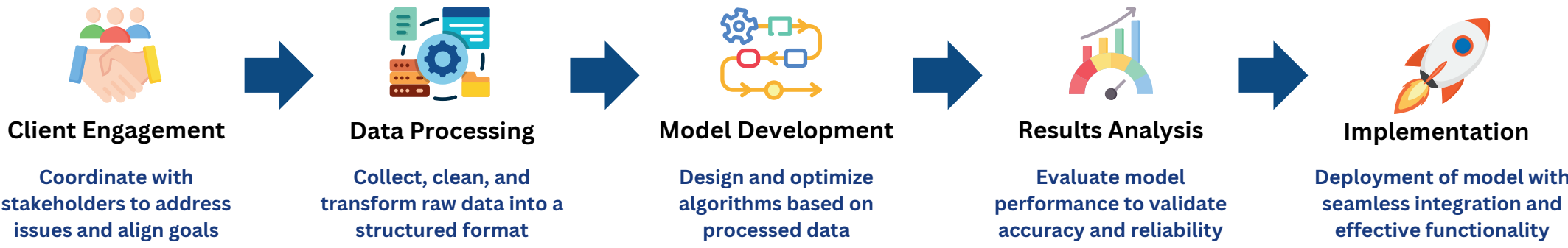
KEY OBJECTIVES

- Data-Driven Targeting**
Develop a Python model to optimize **MOQ** based on customer behavior, providing **actionable insights** to aid LCT negotiations and improve compliance.
- Ensure Operational Compliance**
Enable at least **99% order frequency compliance** to streamline operations.

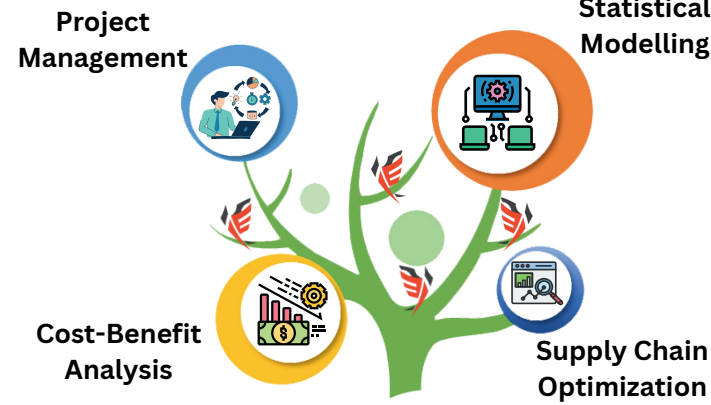
Optimized Discount Allocation
Align the **discount factor** with data-backed targets, focusing on non-compliant customers.

Automated Computation
Standardize monthly evaluations using a Python-based model for **scalable, repeatable reporting**.

3 METHODOLOGY

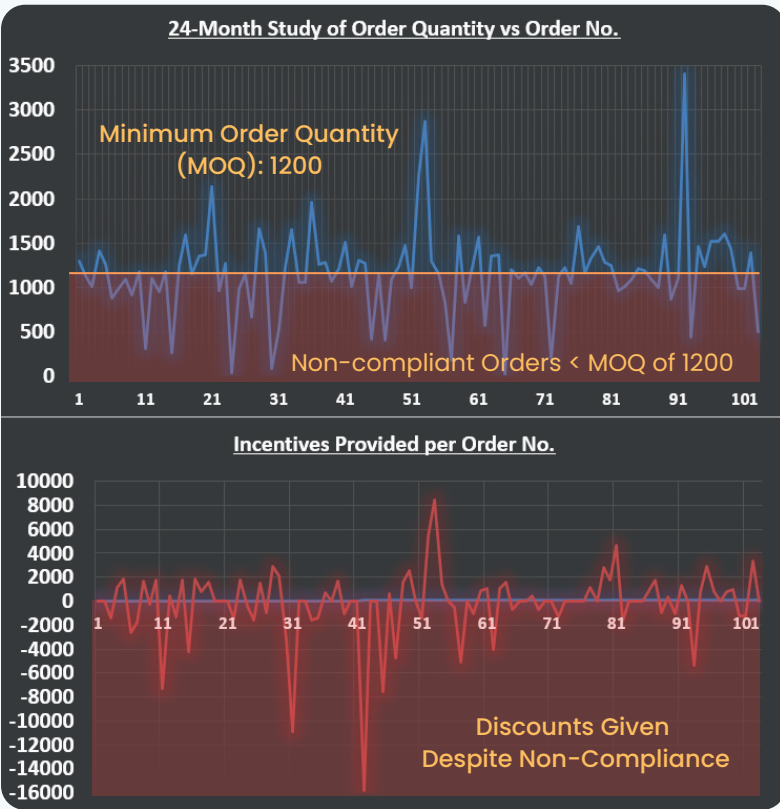


4 KEY SKILLSETS



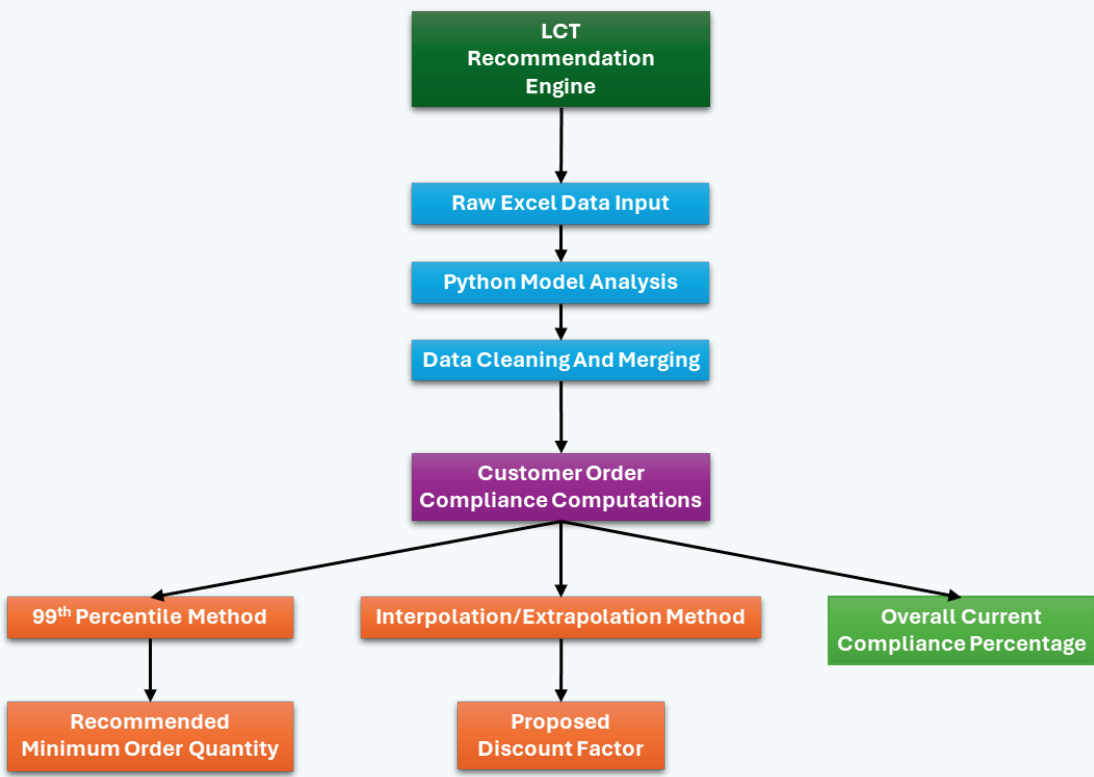
5 PROJECT IMPLEMENTATION

DATA PROCESSING



- SOURCE**
24 months of customer order data from P&G's global market source.
- METHOD**
Developed a **Python**-based pipeline to perform data cleaning, standardization, and aggregation.
- OUTCOME**
Consolidated and structured dataset from 200 columns to 20 **essential** columns for analysis, enabling streamlined computations.
- MAIN DRIVER**
Data interpretation led to insights on **non-compliant** customers.

SYSTEM ARCHITECTURE



LIMITATIONS

- Incomplete data for key metrics like order weight and volume limits analysis depth.
- Model is based solely on past order data as inventory-level data is inaccessible.

KEY TAKEAWAYS

- Minimise Value Leakage**
Non-compliant customers were swiftly identified through our model, enabling timely action to increase compliance rates.
- Informed Decision Support**
While the recommended MOQ is based on data-driven insights, final decision remains with P&G's business team to align with their set objectives.

99TH PERCENTILE METHOD: COMPLIANCE AND MOQ COMPUTATION

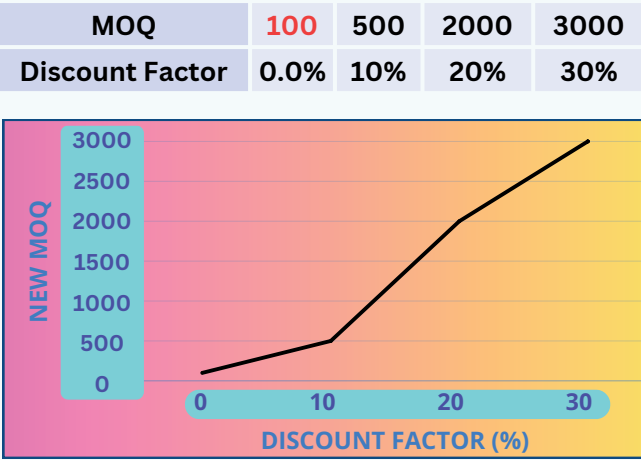
Sorted Average Order Quantity	Discount Amount	Discount Amount / Total Sum of Discounts	Cumulative Sum %	Compliance %
622	-3294	0.021%	0.021%	100.000%
634	-3379	0.022%	0.043%	99.979%
634	-3379	0.022%	0.065%	99.957%
638	-3395	0.022%	0.087%	99.935%
:	:	:	:	:
:	:	:	:	:
:	:	:	:	:
:	:	:	:	:
754	-3773	0.024%	0.877%	99.148%
763	-3513	0.023%	0.899%	99.123%
763	-3513	0.023%	0.922%	99.101%
763	-3543	0.023%	0.945%	99.078%
763	-3543	0.023%	0.968%	99.055%
763	-4198	0.027%	0.995%	99.032%
763	-4198	0.027%	1.023%	99.005%
765	-3555	0.023%	1.046%	98.977%
766	-3401	0.022%	1.068%	98.954%
767	-3466	0.022%	1.090%	98.932%

Minimum Order Quantity (MOQ) Recommendation
MOQ are derived such that customers can meet compliance at least 99% of the time, ensuring operational efficiency.

- COMPUTATIONAL PROCEDURE:**
 - Organize and sort customer's **Average Order Quantity** against **Discount Amount**.
 - Compute **Cumulative Discount Distribution** of all orders.
 - Identify **MOQ threshold** that encompasses 99% of total discounts, proposing this as the new quota benchmark.

Benefits of Method
This methodology allows for **adjustable** compliance targets based on business objectives.
The model will recommend to increase the MOQ even when compliance is achieved, supporting greater **efficiency** and **profitability**.

INTER/EXTRAPOLATION METHOD: DISCOUNT FACTOR



- Discount Factor Derivation**
Optimal discount rates are interpolated/extrapolated based on the recommended MOQ.
- Discount factors are calibrated for each recommended MOQ.
 - A customizable threshold policy (**100**) is incorporated to ensure no discounts are offered for inefficient small orders.

Customer Name: XYZ, Customer Level, MOQ: 1200.0					
Monthly Compliance Summary:					
Year	Month	HIT	MISS	QTY Compliance (%)	
0	2021	1	-2546.63	-4802.27	38.53
1	2021	2	-3749.3	-8342.11	31.81
2	2021	3	-4955.83	-9372.55	34.58
3	2021	4	-7369.69	-1714.32	81.13
4	2021	5	-6787.32	-8196.97	45.38
5	2021	6	-9789.41	-7998.23	55.83
6	2021	7	-1457.18	-5880.47	22.29
7	2021	8	-3668.50	-4265.45	46.24
8	2021	9	-4839.74	-5267.55	47.88
9	2021	10	-9747.53	-5549.8	63.72
10	2021	11	-3662.89	-2383.66	69.57
11	2021	12	-5245.64	-7634.57	48.73
12	2022	1	-1343.26	-1872.42	41.77
13	2022	2	-3864.37	-2755.88	52.65
14	2022	3	-1914.35	-5811.79	24.78
15	2022	4	-2874.65	-4112.18	41.14
16	2022	5	-8008.28	-1897.56	80.84
17	2022	6	-3226.28	-5754.13	35.93
18	2022	7	-9901.25	-6161.75	61.64
19	2022	8	-7916.48	-6962.88	53.28
20	2022	9	-5892.35	-6322.24	44.61
21	2022	10	-1471.81	-1425.67	58.78
22	2022	11	-1178.74	-5049.52	18.93
23	2022	12	-6675.42	-4930.77	57.52
Overall QTY Compliance Rate: 48.65					
Current MOQ: 1200.0					
Suggestion: Decrease the MOQ to ensure ~99% compliance.					
New MOQ for ~99%: 763 (Rounded Down to nearest hundred: 700)					
Proposed MOQ Discount: 11.3333% (Based on MOQ rounded down to nearest hundred.)					

Case Study:
Overall Compliance Rate of Customer XYZ over a time horizon of 24 months processed by the Python model. Corresponding **Proposed Discount** aligns with **new MOQ**.

6 BENEFITS & ACHIEVEMENTS

PROJECT BENEFITS

- Reduces unnecessary logistic costs by improving pallet utilization and truckload efficiency.
- Improve compliance among non-compliant customers.
- Enables more efficient customer order behaviour across markets.

KEY ACHIEVEMENTS

- Constructed a scalable framework which P&G can utilise in other markets.
- Analysed P&G order data to inform critical business decisions.
- Leveraged ISE-acquired expertise in statistical and analytical modelling to address business needs in the global market.

7 FUTURE DIRECTION

- Further scale the model to other markets.
- Integrate market-specific LCTs for more nuanced recommendations.
- Include analysis of order frequency variance to identify non-compliance due to uneven shipment distribution.
- Automate dashboard generation to monitor quota compliance over time.