Project Dissertation Report on

SUPPLIER PERFORMANCE SCORING FRAMEWORK

Submitted By

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CERTIFICATE

This is to certify that Piyush Gupta (23/BMBA/16) has fulfilled a portion of the requirements for the Master of Business Administration (MBA) degree from Delhi School of Management, Delhi Technological University, New Delhi, by submitting the project report titled "SUPPLIER PERFORMANCE SCORING FRAMEWORK" during the academic year 2024–2025.

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DECLARATION

I hereby declare that the work done on this report is solely carried out by me and is being submitted to Delhi School of Management, Delhi Technological University for the partial fulfilment for the degree of Masters of Business Administration, academic period 2024-2025.

Signature of Supervisor

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EXECUTIVE SUMMARY

This project dissertation report, titled **"Supplier Performance Scoring Framework,"** encapsulates a comprehensive initiative to design and implement a scalable, data-integrated, and modular framework for evaluating and benchmarking supplier performance in the material handling function of an FMCG company.

One of the key levers to achieve this is robust supplier performance management. This project presents the design and development of a **Scalable, Data-Integrated, and Modular Supplier Performance Scoring Framework** aimed at evaluating and benchmarking suppliers involved in inbound material handling for an FMCG company.

The primary objective of this system is to enable procurement and supply chain teams to make **transparent, data-backed, and strategic sourcing decisions** by continuously monitoring supplier performance across multiple critical dimensions. These include delivery efficiency, supply quality, responsiveness, pricing competitiveness, and compliance with service level expectations.

The framework evaluates each supplier on **nine distinct metrics**—On-Time Delivery, In-Full Delivery, Capacity, Handling Quality, Supplier Defects, Responsiveness, Reliability, Pricing, and Issue Resolution. Each metric is scored out of 10 and derived from both system-generated sources (such as ERP, GRN systems, and SCM apps) and manually curated trackers (e.g., CAPA trackers, internal forms, and price logs). A **weighted average scoring model** is applied, with configurable weights that allow the organization to emphasize different priorities such as quality, cost, or service level depending on strategic requirements.

To ensure granularity and actionable insights, the scoring is also **mapped category-wise** (e.g., Jerry Cans, Oils, Chemicals), providing a clear view of supplier performance within specific raw material streams. This empowers procurement managers to tailor engagement strategies, negotiate effectively, and make informed decisions on supplier retention, development, or replacement.

A user-friendly **dashboard interface built on Streamlit** facilitates monthly data entry, automated scoring, visualization of supplier performance trends, and identification of risk-prone vendors. Key features include horizontal bar charts, supplier ranking tables, category-wise top performers, and integrated risk analysis, offering a comprehensive view of supply-side health.

Furthermore, the system’s design promotes **transparency, accountability, and**

continuous improvement. Suppliers can receive structured feedback, and internal stakeholders gain visibility into key performance indicators that were previously difficult to consolidate and interpret.

Overall, the framework bridges operational and strategic supply chain functions by offering a **flexible, repeatable, and scalable performance management tool** that aligns supplier contributions with business goals. It enhances procurement efficiency, supports long-term vendor development, and helps mitigate supply chain risks, making it a valuable asset for any FMCG organization pursuing excellence in supplier relationship management.

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CHAPTER 1: INTRODUCTION

1.1 Background

In today's fast-paced FMCG industry, managing inbound supply chains efficiently is a critical driver of business performance. Supplier reliability, timely deliveries, and consistent quality have a direct impact on production continuity and customer satisfaction. As companies increasingly adopt data-driven decision-making, evaluating supplier performance using structured frameworks is no longer a luxury—it's a necessity. Traditional supplier evaluation methods often lack consistency, transparency, and real-time integration with operational data. This creates challenges in ensuring accountability and improving performance across the supply chain. The need for a robust, flexible, and category-specific supplier evaluation mechanism has thus become imperative.

1.1.1 The Changing Dynamics of FMCG Procurement

The Fast-Moving Consumer Goods (FMCG) industry operates under razor-thin margins, where supply chain efficiency, cost control, and timely delivery are critical levers for competitiveness. Given the pace of consumption and product movement in this sector, the **inbound procurement function**—which manages the inflow of raw materials, packaging components, and semi-finished goods—plays a pivotal role in ensuring uninterrupted production cycles.

In recent years, the supply chain landscape in FMCG has undergone a transformative shift, driven by:

- Increased demand volatility due to changing consumer behavior.
- Geopolitical disruptions (e.g., COVID-19, Russia-Ukraine conflict) impacting raw material sourcing.
- Rising focus on sustainability and traceability.
- Integration of digital technologies such as AI/ML, ERP, and IoT.

As companies become more data-driven, supplier performance evaluation is evolving from ad-hoc reviews to real-time, KPI-led monitoring systems.

1.1.2 Why Supplier Performance Matters in FMCG

The cost of a poor-performing supplier is not limited to financials. Delayed deliveries, inconsistent quality, or frequent coordination breakdowns can lead to:

- **Production halts**, impacting distribution schedules.
- **Higher working capital** due to last-minute emergency purchases.
- **Reputational loss**, especially in segments like food, personal care, and pharmaceuticals.
- **Customer churn**, particularly when product availability is compromised on retail shelves.

With over 60-70% of FMCG production costs tied to raw material inputs, a systematic approach to managing supplier performance is not only desirable—it's essential for business continuity and margin protection.

1.1.3 Limitations of Traditional Evaluation Approaches

Historically, procurement teams relied on **manual tools** such as Excel-based trackers, informal stakeholder feedback, and quarterly vendor reviews. These methods suffer from:

- **Lack of standardization** – Metrics vary across categories or buyers.
- **Subjectivity** – Human bias in scoring vendors.
- **Delayed actionability** – Problems identified too late for course correction.
- **Data fragmentation** – ERP, quality, and finance systems not integrated.

As organizations scale, these challenges multiply, weakening vendor relationships and reducing procurement's strategic value. Hence, the need for a **digitally integrated, multi-metric supplier scoring system**.

1.1.4 Evolution Toward a Structured Framework

A structured **Supplier Performance Scoring Framework (SPSF)** consolidates data from various systems, applies pre-defined scoring logic, and outputs a score that can be tracked monthly. It introduces:

- **Objectivity**: Clear definitions for each performance dimension.
- **Comparability**: Category-specific benchmarking.
- **Proactiveness**: Early detection of underperformance.
- **Scalability**: Expansion to new categories and regions.

This study is an attempt to implement such a system tailored for an FMCG company's

inbound procurement function—starting with high-impact categories like Jerry Cans, Oils, and Chemicals.

1.2 Problem Statement

Despite the strategic importance of inbound supply chain management, the organization lacked a structured and objective framework for evaluating supplier performance across multiple raw material categories. Supplier feedback was often anecdotal or manually recorded, leading to delays in corrective action and biased assessments. Additionally, the absence of integrated digital tools restricted real-time decision-making and cross-functional collaboration.

1.2.1 Lack of Formalized Evaluation Criteria

There was no unified framework to compare or rank suppliers. Different category buyers used different metrics—some tracked delivery timelines, others focused on cost or responsiveness. This inconsistency prevented leadership from making holistic supplier decisions.

Example: A supplier consistently late in deliveries was retained over others because of better personal rapport with buyers or one-time cost savings.

1.2.2 Inadequate Use of System Data

Though the organization had invested in ERP and SCM tools (e.g., GRN entries, PO records), these data points weren't being mined or visualized meaningfully. Important metrics like **In-Full, On-Time, and Defect Rates** remained buried within raw logs.

Impact: Procurement managers missed early signs of slippage, leading to last-minute firefighting.

1.2.3 Manual Dependency and Bias

Subjective vendor evaluations—often based on emails, calls, or verbal discussions—resulted in:

- Vendor favoritism
- Underreporting of chronic issues
- Lack of accountability during audits

Manual trackers also introduced the risk of human error, outdated data, and duplicated

efforts.

1.2.4 No Real-Time Visibility or Digital Interface

Vendor scorecards were created on an ad-hoc basis, typically once per quarter. There was no **real-time dashboard** for category managers to see performance trends or compare vendors within the same category.

This led to:

- Missed opportunities for cost reduction or supplier rationalization.
- Inability to create cross-functional alignment (e.g., Quality, Logistics, Finance).

1.2.5 Disconnected Corrective Action Planning

Even when issues were identified, the absence of a centralized performance tracking system meant that **Corrective and Preventive Actions (CAPA)** were not monitored consistently. This limited the organization's ability to drive continuous improvement.

1.3 Objectives of the Study

The study aims to:

- Design a modular and scalable supplier performance scoring framework.
- Integrate both quantitative system-generated metrics and qualitative manual assessments.
- Enable monthly tracking, benchmarking, and ranking of suppliers across key performance indicators.
- Support category-wise analysis to guide strategic sourcing decisions.
- Offer a user-friendly digital interface for procurement teams.

1.3.1 Designing a Modular Framework

Create a framework that can:

- Be applied across product categories.
- Allow addition or removal of metrics based on business priorities.
- Work with different data formats (manual, system-based).

1.3.2 Combining Quantitative and Qualitative Data

Develop a scoring model that includes:

- Quantitative metrics like On-Time, In-Full, and Quality Defects from ERP.
- Qualitative metrics like Responsiveness and Reliability from stakeholder feedback.

1.3.3 Monthly Tracking and Benchmarking

Enable monthly supplier score generation that supports:

- Trend analysis over time.
- Comparison within a category or across regions.
- Identification of high-risk or high-potential vendors.

1.3.4 Strategic Sourcing Support

Inform long-term sourcing decisions like:

- Annual rate contract renewals.
- Vendor addition or delisting.
- Incentive or penalty-based contracts.

1.3.5 Development of a Streamlit Dashboard

Build a **user-friendly, visual dashboard** for procurement teams to:

- Monitor vendor scores.
- Deep dive into specific KPIs.
- Download reports for review meetings.

1.4 Scope of the Study

The project focuses on evaluating suppliers within the **Inbound Material Handling function** of an FMCG company, covering categories such as **Jerry Cans, Oils, and Chemicals**.

The scope includes:

- Identifying relevant performance dimensions.
- Defining KPIs and metrics.
- Collecting data from ERP systems, trackers, and internal forms.
- Developing a Streamlit dashboard for visualization and reporting.
- Applying the model to real suppliers across categories for analysis and insights.

1.4.1 Organizational Context

The study is conducted within the **Inbound Material Handling function** of a leading FMCG company. The company sources raw materials from multiple Tier 1 and Tier 2 suppliers across India.

The initiative was anchored by the **Procurement Excellence Team** and aligned with digital transformation efforts in supply chain analytics.

1.4.2 Category Coverage

Three high-priority raw material categories were selected for the pilot phase:

1. **Jerry Cans** – Rigid plastic containers used for storing edible oils and chemicals.
2. **Edible Oils** – Primary input for food and personal care products.
3. **Chemicals** – Emulsifiers, surfactants, and preservatives used in product formulation.

These categories were chosen because they:

- Are mission-critical to production.
- Have a diverse supplier base.
- Exhibit known performance issues.

1.4.3 Core Activities and Deliverables

The study involved the following components:

1. Identifying Performance Dimensions

Collaborated with stakeholders from Procurement, Quality, Logistics, and Finance to shortlist relevant KPIs, including:

- On-Time Delivery
- In-Full Quantity
- Capacity Adherence
- Quality Defects
- Price Volatility
- Issue Resolution Time

2. Defining KPI Logic and Weightage

Each KPI was defined in terms of:

- Data source (system or manual)
- Calculation formula (e.g., OTIF % = Deliveries on time / Total deliveries)
- Scoring logic (10-point scale)
- Weightage allocation per category

3. Data Collection

Data was collected from:

- ERP systems (SAP, Oracle)
- Internal trackers (Google Sheets, Excel)
- CAPA logs
- Team inputs via structured forms

4. Model Building

Used Python and Pandas to process the data and calculate scores. Integrated scoring logic with a Streamlit dashboard to allow:

- Category filtering
- Monthly trend tracking
- Drill-downs per supplier and metric

5. Real-World Application

Tested the model on 15 suppliers over a 3-month period (Jan–Mar 2025). Conducted stakeholder interviews to validate findings and identify improvement areas.

1.4.4 Out-of-Scope Items

To ensure project focus and manageability, the following were excluded:

- Downstream supply chain partners (e.g., distributors, retailers)
- Sustainability metrics (to be included in Phase 2)
- International suppliers or import data
- Direct cost savings calculation (except through inference)

CHAPTER 2: LITERATURE REVIEW

2.1. Introduction

The effectiveness and strategic value of supplier performance management have long been explored in operations and supply chain management literature. With rising global competition, businesses are placing increased emphasis on aligning supplier capabilities with organizational goals. This literature review delves into the theories, frameworks, models, and empirical studies related to supplier performance evaluation, supplier relationship management, procurement analytics, and multi-criteria decision-making.

Supplier performance evaluation serves as a critical mechanism for optimizing supply chain efficiency and enhancing organizational competitiveness. Traditional evaluation techniques were primarily focused on cost, quality, and delivery, but modern approaches have expanded to include sustainability, innovation, and risk management. As businesses shift toward data-driven decision-making, the role of analytics and real-time monitoring in supplier evaluation has become increasingly significant.

2.2. Evolution of Supplier Performance Evaluation

- **Dickson (1966)** analyzed 23 critical factors for supplier selection, including quality, delivery, performance history, and technical capability, marking the foundation for modern evaluation techniques.
- **Weber et al. (1991)** later consolidated these into core dimensions widely accepted today, emphasizing cost, quality, and delivery as primary criteria for supplier assessment.
- **Ho, Xu, & Dey (2010)** expanded the evaluation criteria to encompass broader dimensions such as innovation, flexibility, ethical compliance, and risk management. This shift reflects growing awareness of the strategic role suppliers play in value creation.
- **Kannan & Tan (2002)** introduced the integration of technology for improving transparency, traceability, and real-time monitoring of supplier performance.
- **Ghadge et al. (2012)** highlighted the increasing complexity of global supply chains and the need for evaluation models that account for multi-tier suppliers and cross-border operations, incorporating metrics for sustainability, regulatory compliance, and geopolitical risks.
- **Mahajan et al. (2023)** introduced the *Weighted Point System* as an advanced model for supplier evaluation. It integrates both traditional KPIs like cost and

quality with modern metrics such as environmental performance and customer satisfaction. A case study at a German gaming company demonstrated its application through 20 KPIs segmented across key performance dimensions, enhancing role clarity and continuous monitoring.

The purchasing department at German Company wants to reduce their supplier database and to evaluate the supplier performances to get the better knowledge of the suppliers. today a great amount of data exists in various department of the business, but it does not reach the purchasing department for various reasons. Therefore, this master thesis aims at carrying out prestudy of a supplier performance evaluation to investigate what KPI's and other measurement that should be used for selection and performance measurement of the suppliers

KPI selected in the paper

Sr No.	KPI's	Less Important	Important	Very Important
1	Price competitiveness	0%	36%	63.4%
2	Quality	9.1%	18.2%	72.7%
3	Supplier Lead Time	0%	54.5%	45.5%
4	Optimum Number of Suppliers (for each product)	0%	30%	70%
5	PO Cycle time	9.1%	54.5%	36.4%
6	Favorable terms and Conditions of Vendor	0%	27.3%	72.7%
7	Spend under Management	0%	63.6%	36.4%
8	Supplier Compliance Rate	10%	10%	80%
9	Supplier Defect Rate	9.1%	36.4%	54.5%
10	Supplier Rejection Rate (Order Rejection)	18.2%	18.2%	63.6%
11	Certification of Supplier (ISO Certification)	20%	50%	30%
12	Emergency Purchase Ratio	9.1%	63.6%	27.3%
13	PO and Invoice Accuracy	0%	27.3%	72.7%
14	Extra Cost (Transport or Shipment Cost)	9.1%	45.5%	45.5%
15	Internal Client Satisfaction	0%	9.1%	90.9%
16	Total CO2 emission (From goods procured from supplier)	0%	63.6%	36.4%

2.3. Frameworks and Models

- **Kaplan & Norton (1996)** introduced the *Balanced Scorecard (BSC)* framework, which extends to supplier contexts to balance financial and strategic goals.
- **Kraljic (1983)** presented the *Kraljic Matrix*, which categorizes suppliers based on complexity and impact to tailor performance strategies accordingly.
- **Ellram (1995)** detailed the *Total Cost of Ownership (TCO)* approach, which

evaluates full lifecycle costs of procurement, including hidden and indirect costs.

The *Supplier Performance Index (SPI)* emerged as a composite score used in operational procurement for comparative assessment.

The *House of Quality (QFD)*, developed as part of quality management principles, translates customer needs into supplier evaluation metrics for better alignment.

- **Thanaraksakul & Phruksaphanrat (2009)** extended the *Balanced Scorecard* to integrate Corporate Social Responsibility (CSR), highlighting the importance of ethical sourcing and environmental performance. This model emphasizes strategic alignment across financial, customer, internal processes, and CSR dimensions.

  In this research a supplier evaluation framework based on Balanced Scorecard (BSC) with integrated Corporate Social Responsibility (CSR) has been developed from literature review of 76 related papers. It was found that quality, delivery, and cost are the most significant criteria. Moreover, some criteria are changed according to shorten product life cycle, technologies, improvement of service, evolution of production system, and emergence of supply chain management (SCM). Based on BSC and CSR, 5 perspectives namely financial, customer, internal business process, learning and growth, and corporate social responsibility are proposed for categorizing supplier selection criteria.

Rank of supplier selection criteria

Criteria	Abbr	No. of Papers	%
Quality[6]	QLT	74	97.37
Delivery[6]	DLV	72	94.74
Cost[6]	CST	72	94.74
Production facility and capacity[6]	PFC	52	68.42
Flexibility and reciprocal arrangement[6]	FLX	52	68.42
Technical capacity and support[6]	TCS	49	64.47
Repair services and follow-up[6]	RSF	45	59.21
Information technology and communication systems[6]	ITC	41	53.95
Financial status[6]	FNS	40	52.63
Innovation and R&D	INV	38	50.00
Operating controls[6]	OPR	34	44.74
Quality system	QTS	33	43.42
Management and organization[6]	MGT	32	42.11
Personnel training and development[6]	PTD	24	31.58
Product reliability	PRT	24	31.58
Performance history[6]	PMH	23	30.26
Geographical location[6]	GEO	23	30.26
Reputation and references[6]	REP	21	27.63
Packaging and handling ability[6]	PKG	18	23.68
Amount of past business[6]	PSB	18	23.68
Customer relationship	CTR	18	23.68
Warranties and claim policies[6]	WCP	15	19.74
Procedural compliance[6]	PCC	15	19.74
Customer satisfaction and impression[6]	CSI	15	19.74
Attitude and strategic fit[6]	ATD	14	18.42
Labor relations record[6]	LRR	9	11.84
Economical aspect	ECN	9	11.84
Desire for business[6]	DFB	8	10.53
Environmental and social responsibility	ENV	6	7.89
Safety awareness	SFT	5	6.58
Domestic political stability	DPS	5	6.58
Cultural congruence	CTC	4	5.26
Terrorism risk	TRR	2	2.63

Note: Abbr: Abbreviation
No. of Papers: Number of papers that appeared the criterion
%: Counted fractions of the criterion to the overall in percentages
[6]: The criteria relating to those 23 criteria which appeared in [6]

2.4. Multi-Criteria Decision-Making (MCDM) Techniques

- **Kahraman, Cebeci, & Ulukan (2003)** explored *Analytic Hierarchy Process (AHP)*, which breaks decision problems into hierarchical structures for pairwise comparison of criteria.
- **Chen, Lin, & Huang (2006)** examined *TOPSIS*, a method for ranking suppliers based on their proximity to ideal solutions.

Fuzzy Logic and Fuzzy AHP have been applied to accommodate uncertainty and vagueness in decision-making, enhancing the robustness of supplier evaluations.

Data Envelopment Analysis (DEA), using linear programming, measures the

relative efficiency of suppliers, benchmarking them against best performers.

- **Onukwulu et al. (2024)** presented an *Innovative Technology-Driven Evaluation Framework* leveraging AI, Blockchain, and cross-functional collaboration for enhanced resilience and real-time monitoring. Key themes included sustainability through ESG integration, predictive analytics for risk assessment, and smart contracts for automated compliance.

2.5. Role of Technology and Analytics

- **Dubey et al. (2017)** emphasized the integration of ERP systems like SAP and Oracle for real-time supplier monitoring and evaluation.
- **Saberi et al. (2019)** explored the role of Blockchain in enhancing traceability, improving supplier accountability, and ensuring compliance.
  Advanced technologies such as *Predictive Analytics* and *AI-driven risk assessment tools* are now used to anticipate disruptions and evaluate geopolitical risks, contributing to proactive supplier performance management.
- **Onukwulu et al. (2024)** also emphasized the role of *Blockchain and IoT* in enhancing supplier traceability and real-time risk monitoring.

2.6. Supplier Relationship Management (SRM)

- **Mentzer, Min, & Zacharia (2001)** defined SRM as a core component of supply chain management, emphasizing trust and shared objectives.
- **Lambert & Schwieterman (2012)** described SRM as a macro business process that integrates supplier evaluations into collaborative improvement plans, leading to enhanced supplier engagement and performance.

2.7. Emerging Trends in Supplier Performance Management

- **Lee (2008)** examined the rising importance of *Sustainability and Green Procurement*, emphasizing eco-friendly practices and sustainable sourcing.
- **Babiceanu & Seker (2016)** discussed *Digital Twins and Smart Contracts*, which facilitate real-time supplier monitoring and automated contract management.
- **Ivanov & Dolgui (2020)** highlighted the application of *Predictive Analytics* for managing supply chain risks, anticipating disruptions through data-driven insights.

- **Krause, Handfield, & Scannell (1998)** analyzed *Collaborative Supplier Development Programs* aimed at enhancing mutual growth and long-term partnerships.
- **Onukwulu et al. (2024)** identified key innovations in *Resilience Management* through AI-driven predictive models, cross-departmental collaboration, and sustainable sourcing.

CHAPTER 3: RESEARCH METHODOLOGY

3.1. Introduction

This study employs a design-oriented, data-integrated methodology to develop a scalable supplier performance scoring framework tailored for an FMCG company's inbound material procurement. The framework is both **quantitative and modular**, allowing procurement teams to make **transparent, data-backed sourcing decisions** across categories such as Jerry Can, Oil, and Chemicals.

3.2. Research Design

The research adopted a **qualitative research design**, primarily driven by semi-structured interviews with key supply chain professionals from **Pwani Oil FMCG, Kenya**. Conducted through Microsoft Teams over a series of multiple sessions, these interviews were instrumental in shaping the design and refinement of the Supplier Performance Scoring Framework.

The objectives of these interviews included:

- Understanding key performance indicators (KPIs) considered critical for evaluating suppliers in the FMCG sector.
- Identifying the practical challenges faced in monitoring metrics such as On-Time Delivery, In-Full Performance, Defect Rates, and Logistical Efficiency.
- Collecting insights on region-specific challenges, such as import dependencies, transportation delays, and infrastructure constraints.
- Gaining feedback on the proposed framework's relevance, usability, and areas for improvement.

The iterative design process involved **multiple rounds of modification**, as suggested by Pwani Oil’s procurement team. Each round of feedback was analyzed, and adjustments were made to:

- Enhance the realism and applicability of KPIs.
- Align weightage distribution with industry priorities.
- Integrate flexibility for category-specific assessments.
- Address logistical issues unique to East African markets.

These refinements ensured that the framework was not only theoretically sound but also practically viable in real-world scenarios. The collaborative approach further allowed for

the identification of local risks and supplier challenges that may not have been evident through secondary research alone.

The research follows a **quantitative descriptive design** with system-building principles. The process includes:

- Identification of key supplier evaluation metrics across logistics, quality, responsiveness, pricing, and compliance.
- Metric definition, score formulation, and data mapping for each parameter.
- Development of a **Streamlit-based dashboard** for monthly performance tracking and visualization.
- Customization for **category-level analysis**, weight configuration, and risk identification.

This structured approach ensures relevance to practical supply chain operations while enabling data-based strategic decisions.

3.3. Data Sources and Collection

Data for this study was collected through a combination of:

3.3.1 Primary Data (Interviews):

- Semi-structured interviews were held with the **Supply Chain and Procurement team of Pwani Oil FMCG** via *Microsoft Teams*.
- Interviews spanned over **5 sessions**, each lasting approximately 45–60 minutes.
- Key personnel included the Procurement Manager, Supply Chain Analyst, and Logistics Coordinator.
- Discussions were focused on:
  - Supplier evaluation criteria specific to FMCG.
  - Real-world application of metrics like On-Time Delivery, Defect Rates, and Capacity Utilization.
  - Suggestions for effective category-wise mapping and risk analysis.

3.3.2 Secondary Data:

- Organizational records such as GRNs, ERP data, and quality control sheets.
- Industry reports and white papers on best practices in Supplier Performance Evaluation.
- Peer-reviewed journals focusing on multi-criteria decision-making and

procurement analytics.

3.3.3 Feedback Analysis and Iterative Refinement:

- After each interview, data was synthesized, and iterative refinements were made to the framework.
- Key improvements included the adjustment of weightage distributions and the inclusion of locally relevant risk factors.
- This iterative design ensured that the final framework was both *practical* and *context-sensitive* to Pwani Oil's operational landscape.

The scoring framework is grounded in **system-extracted data** from ERP, SCM platforms, and internal trackers, complemented by **manual entries** for qualitative ratings.

Data Source	**Metrics Captured**
ERP	On-Time Score, In-Full Score
ERP	Capacity Score, Handling Score
Manual Entry	Supplier Defects, Pricing Score
Internal Forms	Response Score
CAPA Tracker	Reliability, Issue Resolution Score
Invoices & POs	Issue Resolution validation

The integration of expert insights from Pwani Oil FMCG added a layer of practical validation to the design of the Supplier Performance Scoring Framework, making it robust and ready for application in dynamic FMCG environments.This hybrid data integration ensures both objectivity and context-specific human judgment.

3.4. Metric Definition and Score Computation

The Supplier Performance Scoring Framework's metric definition was developed based on both industry standards and the practical insights obtained through interviews with Pwani Oil FMCG. The company's supply chain experts highlighted the importance of capturing diverse performance dimensions, including:

Each metric is defined with a clear formula and scaled to a **maximum score of 10**.

3.4.1 On-Time Score (Max 10)

- **Definition:** Measures the proportion of required quantity delivered on or before the expected date. This was identified as a critical KPI by Pwani Oil due to the impact of logistical challenges in East Africa.
- **Formula:** (On-Time Qty / Required Qty) × 10
- **Example:** Required Qty: 100, Expected Delivery date: 15th, Delivered: 40 on 10th, 30 on 14th (on-time), 30 on 26th (late) On-Time Qty = 70 → Score = (70/100) × 10 = 7.0

3.4.2 In-Full Score (Max 10)

- **Definition:** Measures whether the complete required quantity was received, regardless of delivery timing. Pwani Oil emphasized this due to supply chain disruptions caused by import dependencies.
- **Formula:** (Total Delivered Qty / Required Qty) × 10
- **Example:** Required Qty: 100 | Delivered: 100
  Score = (100/100) × 10 = 10.0

3.4.3 Capacity Score (Max 10)

- **Definition:** Assesses whether the supplier has adequate historical delivery capacity compared to required demand. Interviews revealed this is crucial for peak seasons.
- **Formula:** (Supplier Capacity / Required Qty) × 10
- **Example:** Required Qty: 100 | Capacity: 92
  Score = (92/100) × 10 = 9.2

3.4.4 Quality Handling (Transportation) Score (Max 10)

- **Definition:** Measures transit-related damage during transportation to plant.
- **Formula:** 10 - [(Damaged Items / Total Delivered) × 10]
- **Example:** Delivered: 100

Damaged: 10 → Score = 10 - (10/100 × 10) = 9.0

3.4.5 Quality Supplier Defects Score (Max 10)

- **Definition:** Captures quality defects that are attributable to the supplier's process or material quality.
- **Formula:** 10 - [(Defective Items / Total Delivered) × 10]
- **Example:** Delivered: 100 | Defective: 5
  Score = 10 - (5/100 × 10) = 9.5

3.4.6 Response Score (Max 10)

- **Definition:** A subjective user rating reflecting supplier's communication speed and issue response. Pwani Oil's team noted that supplier responsiveness directly affects their production schedules.
- **Example:** Supplier responds swiftly and resolves queries same day Score = 9.0

3.4.7 Reliability Score (Max 10)

- **Definition:** A subjective rating based on consistency in supply, adherence to commitments, and support.
- **Example:** Supplier consistently delivers without issues → Score = 8.5

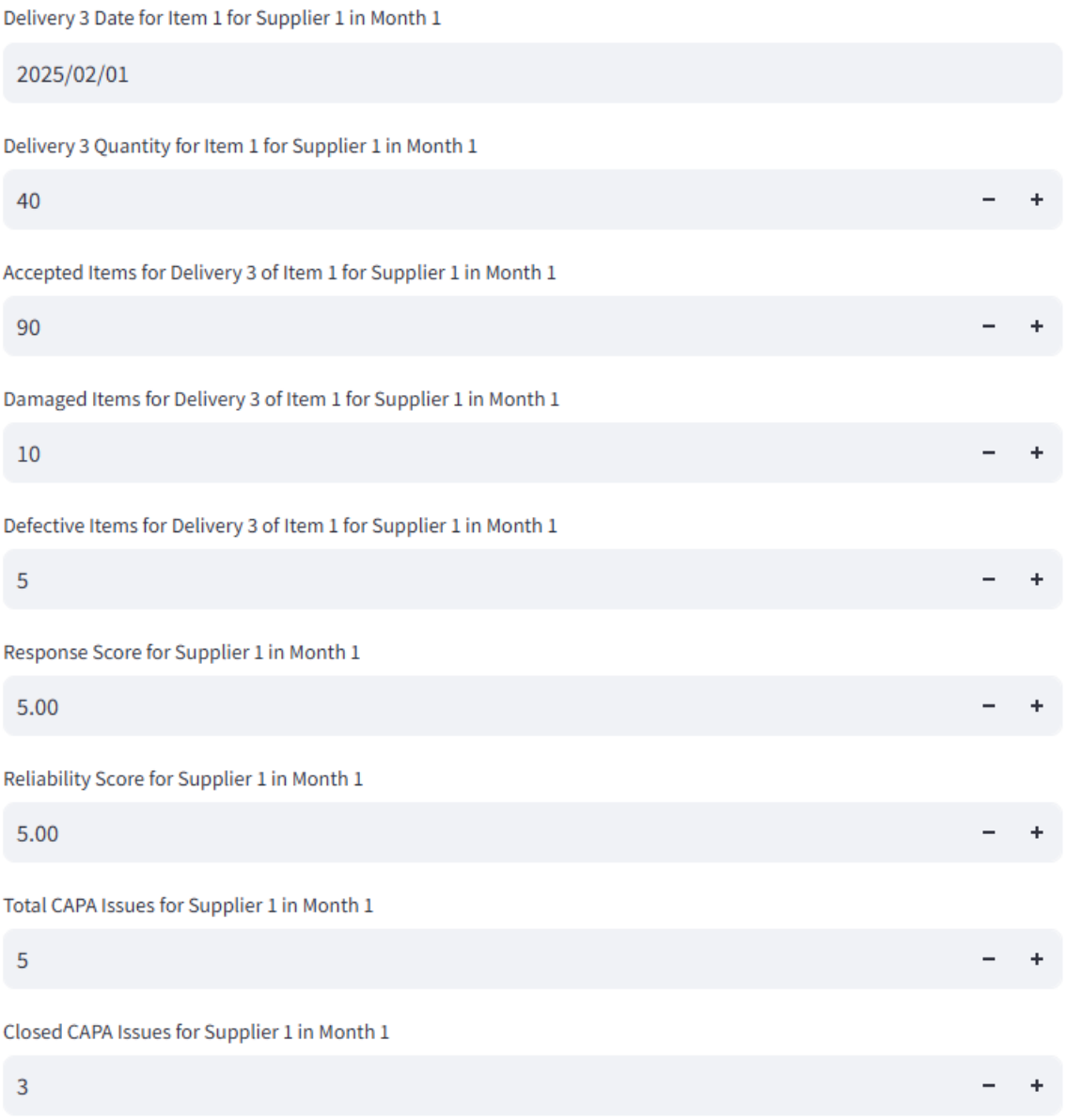
3.4.8 Issue Resolution Score (Max 10)

- **Definition:** Measures the percentage of Corrective and Preventive Actions (CAPA) issues resolved.
- **Formula:** (Closed CAPA Issues / Total CAPA Issues) × 10
- **Example:** CAPA Raised: 5 | Closed: 3 → Score = (3/5) × 10 = 6.0

3.4.9 Pricing Score (Max 10)

- **Definition:** Evaluates how competitive the supplier's price is compared to average and benchmark.
- **Formula:** (6M Avg Price / Supplier Price) × (Standard Price / Supplier Price) × 10
- **Example:** Standard: ₹90 | Avg: ₹99.83 | Supplier: ₹100 → Score ≈ 9.0

Data collection Interface



Feedback from Pwani Oil FMCG led to iterative refinement of weightage assignments for each metric, ensuring alignment with real-world challenges. Each metric is scored on a scale of 10, contributing to a weighted average for final assessment.

3.5. Weighted Score Aggregation

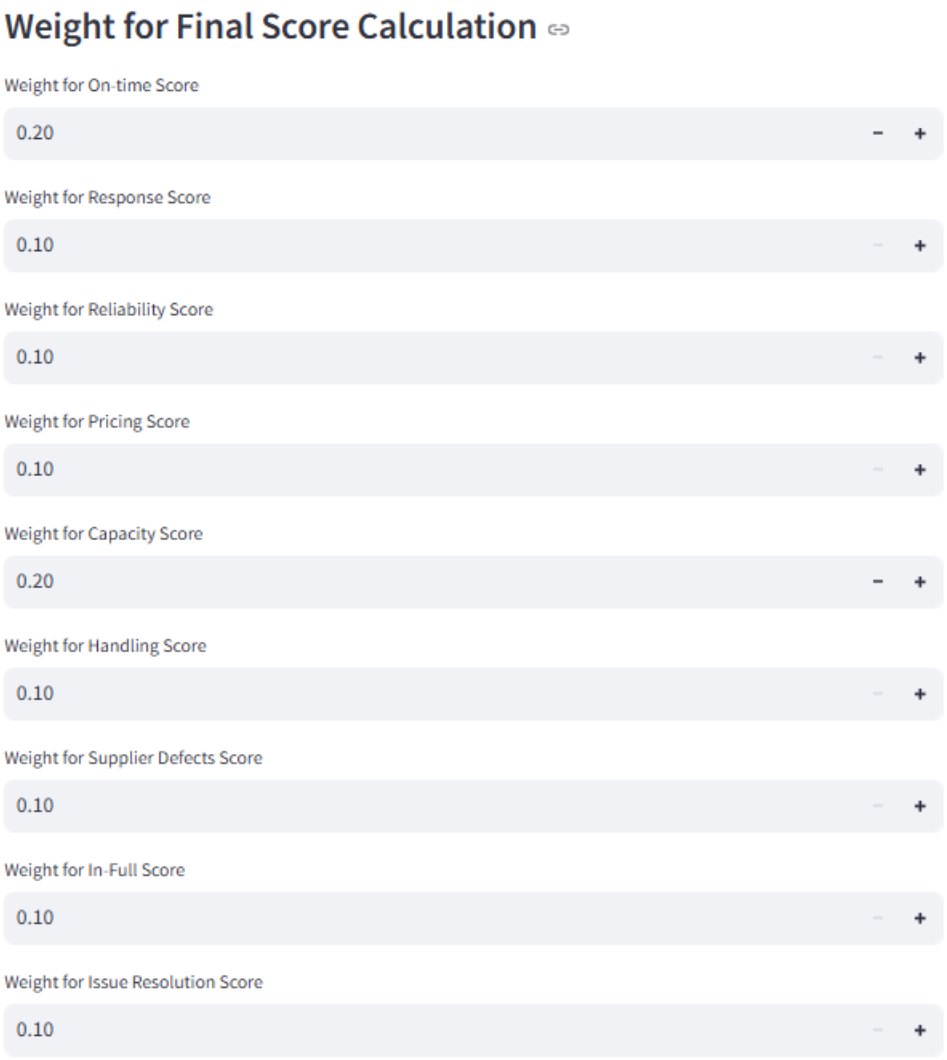
A **configurable weighted average** model is applied to compute a final supplier performance score. Weights can be customized by business stakeholders based on strategic focus. The default weight configuration is:

Metric	Weight (%)
On-Time Score	20
Capacity Score	20
Handling Score	10
Supplier Defect Score	10
Response Score	10
Reliability Score	10
In-Full Score	10
Pricing Score	5
Issue Resolution Score	5

The Final Score is computed as:

Final Score = Σ (Metric Score × Weight) / Total Weight

Weight edit option on UI



3.6. Category-wise Mapping and Visualization

To enhance visibility and strategic decision-making, suppliers were mapped based on their performance across the defined metrics. This category-wise mapping involved:

1. **Categorization:** Suppliers were segmented into performance categories such as *Top Performers*, *Consistent Suppliers*, and *Underperformers*. This segmentation was primarily influenced by Pwani Oil's feedback, which emphasized the need for granular visibility in procurement decision-making.
2. **Streamlit Dashboard:** A **Streamlit-based interactive dashboard** was designed to visualize supplier performance:
    - **Horizontal Bar Charts** to rank suppliers across each metric.
    - **Risk Analysis Dashboards** for highlighting suppliers with fluctuating performance.

- **Category-Wise Comparison** for tracking suppliers in Oil, Chemicals, and Packaging materials.

3. **Strategic Sourcing Decisions:** The mapping enabled Pwani Oil's team to:
    - Identify key risk areas and develop contingency plans.
    - Prioritize suppliers for strategic partnerships.
    - Facilitate category-specific negotiations based on historical performance data.

3.7. Risk Analysis and Continuous Improvement

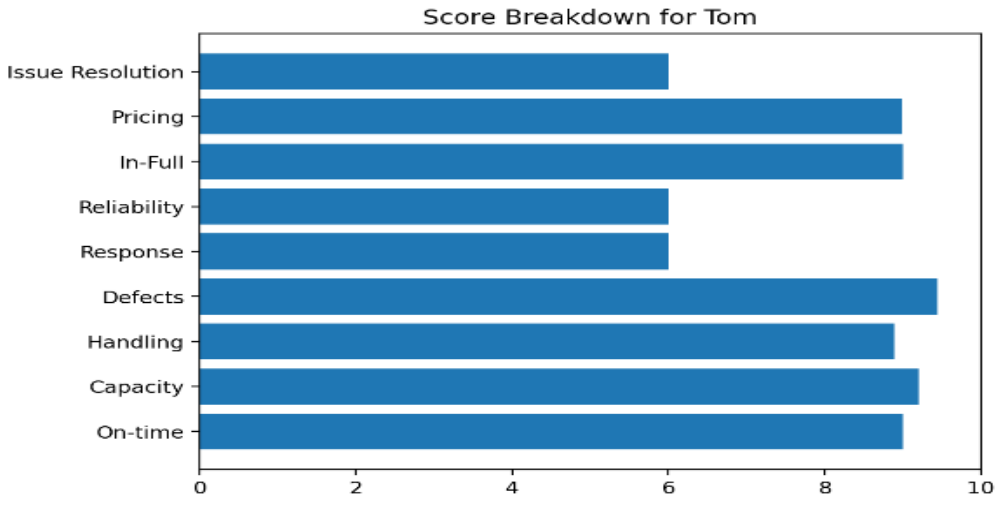
A dedicated **risk analysis module** flags suppliers with low or fluctuating scores across parameters. By tracking trends over time, the system supports:

- Early detection of supply risks.
- Corrective actions aligned with CAPA outcomes.
- Transparent reporting to leadership for sourcing alignment.

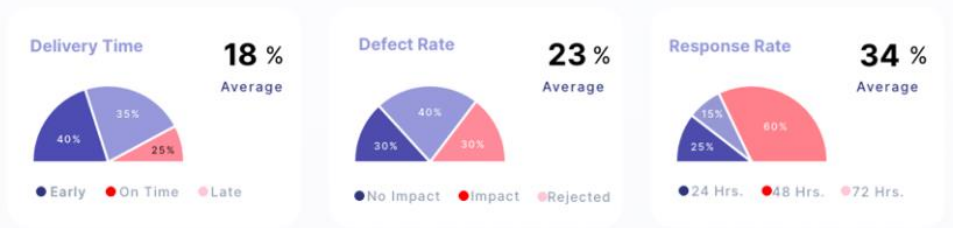
3.8. Ethical Considerations

The system uses **anonymized supplier data** only for internal evaluation and improvement purposes. All manual scores are reviewed by cross-functional stakeholders to minimize subjective bias.

- Horizontal bar charts for performance visualization



- Risk Analysis



CHAPTER 4: PROJECT ANALYSIS

4.1. Key Insights

The structured analysis and implementation of a supplier evaluation framework in the FMCG industry have generated numerous insights essential for decision-makers in procurement and operations. These insights have implications not only for immediate supplier interactions but also for long-term sourcing strategy and supply chain resilience.

4.1.1 Supplier Performance Varies by Category Detailed examination revealed significant variance in performance depending on the category. For example, suppliers of Jerry Cans consistently scored higher in delivery punctuality, likely due to more established logistics channels and simpler handling requirements. Conversely, suppliers of Oils and Chemicals exhibited challenges in ensuring compliance with documentation and quality assurance, potentially due to more complex transport and storage needs. The category-specific nature of issues necessitates customized evaluation models for accurate assessment.

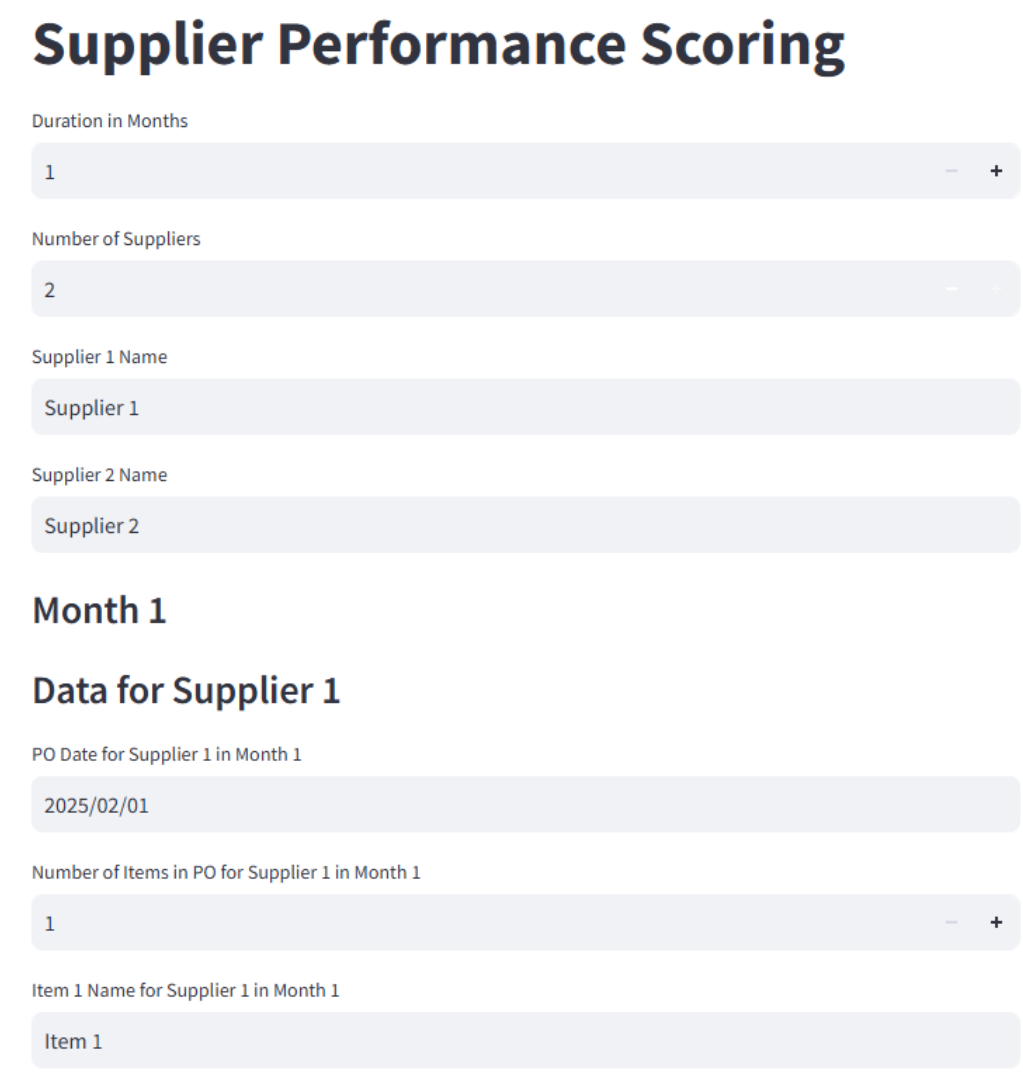
4.1.2 Quantitative Metrics Do Not Tell the Full Story While quantitative KPIs such as delivery timelines and quantity accuracy are useful, they do not provide a complete picture. Suppliers who performed well on system-generated KPIs occasionally scored low on qualitative parameters like responsiveness, highlighting the importance of incorporating soft performance indicators. A supplier delivering on time but failing to communicate proactively about delays or deviations represents a risk not captured by hard metrics.

4.1.3 Need for Customizable KPI Frameworks KPI relevance varied by category. Leak test results were crucial for Jerry Can suppliers but irrelevant for Oil and Chemical suppliers, where viscosity testing or chemical composition verification was more appropriate. A rigid, uniform evaluation system would have misrepresented performance and led to inappropriate corrective measures. Flexibility in KPI weighting and definition proved essential for fairness and strategic relevance.

4.1.4 Manual Feedback is Indispensable Yet Subjective Feedback from procurement teams provided insights into supplier behavior, including flexibility during urgent orders and adherence to internal compliance norms. However, manual assessments were inconsistent, as different individuals prioritized different aspects. Some emphasized communication; others focused on packaging or documentation. Standardizing this input through rating scales and guided formats improved data reliability.

4.1.5 Digital Dashboards Drive Engagement The deployment of an interactive Streamlit dashboard allowed real-time tracking and easy visualization of supplier performance. This digital interface encouraged monthly reviews and fostered better communication within procurement and between procurement and suppliers. In particular, the ability to benchmark suppliers and compare them across timeframes proved valuable in assessing the impact of improvement initiatives.

Stream lit UI



4.2. Data Collection (Sources and Approach)

4.2.1 Data Sources

Data was sourced through a multi-pronged approach encompassing both automated system outputs and manual inputs:

1. **ERP Systems (e.g., SAP):**
    - Goods Receipt Notes (GRNs) to determine delivery timeliness.
    - PO vs Invoice date comparisons to assess billing promptness.
    - Material quantity comparisons to assess fulfillment accuracy.
2. **Procurement Trackers and Excel Logs:**
    - Maintained by category teams.
    - Captured qualitative issues such as packaging failures, wrong labeling, delayed responses.
3. **Manual Feedback Forms:**
    - Designed to collect structured feedback from buyers.
    - Included Likert-scale questions and optional comments.
4. **Quality Assurance Reports:**
    - Data on quality check rejections.
    - Incident reports for material failures.
5. **Email and Communication Records:**
    - Used to verify responsiveness and dispute resolution time.

Backend Data

```
# Pricing Data
six_month_avg_pricing_data = {
    'Tom': {'Oil': 99.83, 'Chemicals': 111.67, 'Jerry Can': 103.33},
    'Harry': {'Oil': 103.5, 'Chemicals': 112.5, 'Jerry Can': 102.33}
}

standard_pricing_data = {
    'Jerry Can': 120,
    'Chemicals': 100,
    'Oil': 90
}

# Supplier capacity data
supplier_capacity_data = {
    'Tom': {
        1: {'Jerry Can': 97, 'Chemicals': 101, 'Oil': 92},
        2: {'Jerry Can': 134, 'Chemicals': 144, 'Oil': 122},
        3: {'Jerry Can': 110, 'Chemicals': 92, 'Oil': 94},
        4: {'Jerry Can': 117, 'Chemicals': 113, 'Oil': 148},
        5: {'Jerry Can': 91, 'Chemicals': 136, 'Oil': 118},
        6: {'Jerry Can': 116, 'Chemicals': 141, 'Oil': 96},
    },
    'Harry': {
        1: {'Jerry Can': 95, 'Chemicals': 101, 'Oil': 103},
        2: {'Jerry Can': 117, 'Chemicals': 107, 'Oil': 126},
        3: {'Jerry Can': 127, 'Chemicals': 130, 'Oil': 118},
        4: {'Jerry Can': 97, 'Chemicals': 112, 'Oil': 142},
        5: {'Jerry Can': 132, 'Chemicals': 104, 'Oil': 130},
        6: {'Jerry Can': 103, 'Chemicals': 129, 'Oil': 141},
    }
```

4.2.2 Approach to Data Collection

1. **Metric Identification:** Metrics were chosen in collaboration with procurement, operations, and quality control stakeholders to ensure relevance and comprehensiveness.
2. **Data Cleaning:** Data underwent validation for consistency in supplier names, date formats, and material descriptions. Redundant and outdated entries were removed.
3. **Normalization and Scoring:** Raw data was transformed into scores on a 0 to 10 scale. For example, delivery delays were assigned negative weights, and documentation completeness earned positive scores. A scoring template was developed to automate score assignment for each metric.

4. **Temporal Mapping:** Scores were calculated month-wise for six consecutive months. This enabled tracking supplier behavior over time and identifying trends.

4.3. Data Analysis

The cleaned and structured data was analyzed to build a supplier scoring model and derive actionable insights.

Supplier: Harry

	month	On-time Score	capacity_score	Quality - Handling (Transportation) Score	Quality - Supplier Defects Score	response_score	Reliability Score	In-Full Score	pricing_score	Issue Resolution Score
0	1	10.0000	0.0000	7.5000	8.7500	5.0000	5.0000	10.0000	0.0000	6.0000
1	2	10.0000	0.0000	7.5000	8.7500	5.0000	5.0000	10.0000	0.0000	6.0000
2	3	10.0000	0.0000	7.5000	8.7500	5.0000	5.0000	10.0000	0.0000	6.0000
3	4	10.0000	0.0000	7.5000	8.7500	5.0000	5.0000	10.0000	0.0000	6.0000
4	5	10.0000	0.0000	7.5000	8.7500	5.0000	5.0000	10.0000	0.0000	6.0000
5	6	10.0000	0.0000	7.5000	8.7500	5.0000	5.0000	10.0000	0.0000	6.0000

Average On-time Score: 10.0

Average Capacity Score: 0.0

Average Quality - Handling (Transportation) Score: 7.5

Average Quality - Supplier Defects Score: 8.75

Average Response Score: 5.0

Average Reliability Score: 5.0

Average In-Full Score: 10.0

Average Pricing Score: 0.0

Average Issue Resolution Score: 6.0

Final Weighted Average Score: 5.66

4.3.1 Scoring Methodology:

1. **Dimension Weighting:**
    - Timeliness: 25%
    - Quality: 20%
    - Documentation: 20%
    - Responsiveness: 15%
    - Compliance: 20%
2. **KPI Breakdown:**
    - Timeliness included GRN vs PO dates, frequency of urgent orders, and unfulfilled lines.
    - Quality captured rejection rates, number of NCRs (non-conformance reports), and sample pass rate.
    - Documentation tracked packing list accuracy, invoice consistency, and MSDS submission.
    - Responsiveness included average email reply time and responsiveness during delivery disruptions.
    - Compliance considered PO acknowledgment and SOP adherence.

4.3.2 Category-Level Segmentation: Each supplier was mapped to their respective material category and evaluated accordingly. This ensured that the same supplier operating across categories received distinct scores reflective of their category-specific performance.

4.3.3 Trend Visualization: Dashboards featured:

- Monthly line graphs to identify improving or declining suppliers.
- Heatmaps to highlight low-performing dimensions.
- Bar charts for comparing top 5 suppliers within categories.

4.3.4 Supplier Tiering: Suppliers were classified into four tiers:

- Strategic Partners (Score > 85): Trusted, long-term suppliers.
- Reliable Vendors (70–85): Steady performers with scope for minor improvement.

- Watchlist Vendors (50–70): Require regular monitoring and engagement.
- Risk Vendors (< 50): Subject to review and potential de-listing.

4.4. Findings and Recommendations

4.4.1 Findings:

- 40% of suppliers showed performance inconsistencies across months.
- Documentation-related non-compliance was the most frequent issue, affecting 60% of suppliers.
- Quality issues were less prevalent but had higher impact, especially in Oils and Chemicals.
- Suppliers on the Watchlist or Risk category often lacked visibility into their performance data.

4.4.2 Recommendations:

- **Introduce Real-Time Alerts:** Use ERP or third-party systems to flag missing documentation or delays at the point of transaction.
- **Monthly Supplier Scorecard Meetings:** Share dashboard outputs with suppliers monthly. This transparency builds trust and sets performance expectations.
- **Procurement SOP Enhancement:** Embed dashboard checks in the PO release process. Make supplier scores part of evaluation for repeat business.
- **Build Supplier Development Programs:** For Watchlist and Risk suppliers, conduct root-cause analysis and offer capability-building sessions.
- **Digital Integration:** Plan for long-term integration of the dashboard with SAP to allow automated score updating.

4.5. Limitations of the Study

- **Incomplete Historical Data:** Some ERP fields were not populated retroactively, creating gaps in delivery or invoice dates.
- **Subjective Manual Inputs:** Buyer feedback could be influenced by isolated events or personal rapport, despite structured forms.

- **Limited Duration:** The six-month period may not be sufficient to evaluate long-term trends such as seasonal impacts or capacity shifts.
- **Dashboard Tool Limitations:** Streamlit, while flexible, lacked advanced user authentication and real-time sync features with ERP.
- **Scope Confinement:** The study was restricted to three categories and may not represent challenges faced in perishable or high-value material sourcing.

CHAPTER 5: CONCLUSION

Efficient supplier performance evaluation is not just a procurement function—it is a cornerstone of supply chain excellence, especially within the fast-paced and competitive FMCG sector. This project addressed the critical gap in objectively assessing supplier contributions to operational efficiency, reliability, and strategic alignment. The outcome is a scalable, modular evaluation framework that empowers procurement teams with data-driven insights and real-time decision support.

The developed framework integrates quantitative metrics such as On-Time In-Full (OTIF) delivery rates, rejection percentages, and lead time variance with qualitative inputs like responsiveness and compliance behavior. By leveraging a balanced scorecard approach, it ensures that performance measurement transcends isolated events and reflects consistent supplier behavior over time.

A key accomplishment of this study lies in its application across diverse raw material categories such as Jerry Cans, Oils, and Chemicals. Each category demanded a customized approach to key performance indicators (KPIs), reflecting unique sourcing challenges, storage requirements, and service expectations. The flexible design of the Streamlit dashboard enabled seamless visualization, dynamic filtering, and month-wise performance tracking—enhancing the transparency and usability of the tool.

Moreover, this project went beyond theoretical design. It operationalized a working model by utilizing real-time ERP data, internal trackers, and manual inputs, offering stakeholders—from purchase officers to senior leadership—a unified platform to benchmark suppliers, identify red flags, and initiate corrective actions. For instance, the ability to auto-generate rankings or trigger alerts for low-performing vendors creates a proactive ecosystem for supplier engagement.

From a strategic viewpoint, the supplier scorecard enables informed sourcing decisions, better contract management, and stronger supplier relationships. It also supports long-term sustainability goals by embedding qualitative criteria such as environmental compliance and ethical sourcing.

However, like any system, the implementation of this model comes with caveats. Continuous data accuracy, user training, cross-functional alignment, and feedback incorporation will be vital to maintaining its relevance and utility. Periodic reviews and

iterations are recommended to accommodate new categories, emerging KPIs, or shifting organizational priorities.

In summary, this study provides a blueprint for organizations aiming to transition from reactive supplier management to a structured, predictive, and collaborative approach. With continuous refinement and stakeholder support, the proposed model has the potential to transform supplier performance management from a transactional process to a strategic advantage.

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