

Design of a Comprehensive Performance Measurement System Using Integrated BSC, AHP, and OMAX with Traffic Light System A Case Study in the E-Liquid Industry

Muhammad Subhan and Suhartini*

Institut Teknologi Adhi Tama Surabaya, Surabaya, Indonesia

*suhartini@itats.ac.id

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Abstract

PT XYZ is an e-liquid manufacturing company undergoing aggressive expansion and experiencing organizational "growing pains." To align operational execution with strategic objectives, this study designs an integrated performance measurement system combining Balanced Scorecard (BSC), Analytical Hierarchy Process (AHP), and Objective Matrix (OMAX) with a Traffic Light System (TLS) visual dashboard. The BSC framework decomposes the corporate vision and mission into 20 Key Performance Indicators (KPIs) across four perspectives. The AHP method prioritizes these metrics, with the Financial Perspective assigned the highest weight (0.48530), followed by the Customer (0.28355), Learning and Growth (0.13594), and Internal Business Process (0.09521) perspectives. Quantitative scoring via OMAX, utilizing a 2024 historical baseline, yields a 2025 Total Performance Index (TPI) of 6.0091, indicating a 42.99% productivity improvement from the baseline (Score 3.0). TLS mapping places overall corporate performance in the Yellow (Cautionary) Zone, while successfully exposing critical operational anomalies in the Red Zone: Overall Equipment Effectiveness (OEE) at a score of 1.5 (actual 65.0%) and Complaint Response Time at a score of 2.5 (actual 35.0 minutes). Corrective and Preventive Actions (CAPA) are proposed, focusing on implementing Total Productive Maintenance (TPM) and a digitalized Customer Relationship Management (CRM) system.

Keywords: Balanced Scorecard, Analytical Hierarchy Process, Objective Matrix, Traffic Light System, E-Liquid Industry, Growing Pains.

Abstrak

PT XYZ merupakan perusahaan manufaktur e-liquid yang tengah mengalami fase ekspansi agresif dan fenomena "growing pains." Untuk menyelaraskan eksekusi operasional dengan sasaran strategis, penelitian ini merancang sistem pengukuran kinerja terintegrasi menggunakan metode Balanced Scorecard (BSC), Analytical Hierarchy Process (AHP), dan Objective Matrix (OMAX), serta divisualisasikan melalui Traffic Light System (TLS). Kerangka BSC digunakan untuk mendekonstruksi visi dan misi perusahaan menjadi 20

Key Performance Indicators (KPI) pada empat perspektif. Metode AHP diaplikasikan untuk menentukan bobot prioritas, di mana Perspektif Finansial menempati prioritas tertinggi dengan bobot 0,48530, disusul oleh Perspektif Pelanggan (0,28355), Pembelajaran dan Pertumbuhan (0,13594), serta Proses Bisnis Internal (0,09521). Hasil implementasi OMAX dengan baseline tahun 2024 menghasilkan Indeks Kinerja Total (Total Performance Index / TPI) tahun 2025 sebesar 6,0091, yang merepresentasikan kenaikan produktivitas sebesar 42,99% dari baseline historis (Skor 3.0). Visualisasi TLS menempatkan kinerja keseluruhan perusahaan pada Zona Kuning (Waspada), serta mengidentifikasi dua anomali operasional kritis pada Zona Merah: Overall Equipment Effectiveness (OEE) dengan skor 1,5 (aktual 65,0%) dan Waktu Respons Keluhan dengan skor 2,5 (aktual 35,0 menit). Tindakan korektif dan preventif (CAPA) yang diusulkan berfokus pada implementasi Total Productive Maintenance (TPM) dan digitalisasi sistem Customer Relationship Management (CRM).

Keywords: *Balanced Scorecard, Analytical Hierarchy Process, Objective Matrix, Traffic Light System, Pengukuran Kinerja, Growing Pains.*

1. Introduction

In the contemporary era of disruptive global business competition, particularly in Fast-Moving Consumer Goods (FMCG) and alternative nicotine products (e-liquid) sectors, corporate survival cannot be measured solely by short-term financial profits. The e-liquid and vaping industry in Indonesia is currently undergoing a market boom, heavily driven by shifting lifestyle trends from conventional cigarettes to alternative vaping devices [1]. However, this lucrative market is characterized by a fierce, hyper-competitive "red ocean" environment, extremely rapid flavor innovation cycles, and stringent government regulations. Most notably, standardizations in health policies and the excise tax tariff on alternative tobacco products (Hasil Pengolahan Tembakau Lainnya/HPTL) directly pressure the industry's cost structures [11]. In such a highly volatile and uncertain business landscape, manufacturing enterprises urgently require a comprehensive performance measurement system (PMS) built on integrated Key Performance Indicators (KPIs) to act as a strategic compass, aligning executive macro-objectives with daily floor operations [15]. According to Dipura et al. [1], KPIs successfully facilitate the translation of organizational objectives into clear physical metrics. Modern performance management also demands dynamic, non-rigid architectures that can adapt to rapid shocks in both internal and external environments [2].

Within this macro-context, PT XYZ stands as a pioneering market leader in the Indonesian e-liquid industry since its establishment in 2015 [14]. Currently, the company is navigating through an aggressive expansion phase. This growth is evidenced by a consistent annual revenue growth rate surpassing 30%, multi-million unit annual production capacities, product portfolio diversification into pod systems, and supply chain expansions into

international markets [14]. Furthermore, its commitment to global quality standards is certified under the ISO 9001:2015 Quality Management System (QMS) [14]. However, this rapid market and financial expansion has triggered severe internal structural anomalies—a phenomenon widely recognized in strategic management literature as organizational "growing pains" [14]. The swift expansion has outpaced the organizational infrastructure, causing friction and operational bottlenecks.

PT XYZ's current evaluation systems are heavily biased toward lagging financial indicators such as sales revenue, cost efficiencies, and gross profit [14]. As theorized by Kaplan and Norton [3], exclusive reliance on financial metrics creates a dangerous "strategic myopia," akin to navigating a vehicle by looking only in the rearview mirror. It fails to detect active operational issues on the shopfloor that determine future survival (leading indicators) [3]. At PT XYZ, this blind spot has hidden severe machine fatigue; due to soaring order volumes, production machinery is forced to operate far beyond its engineered limits without adequate preventive maintenance [14]. This has led to an alarming degradation of Overall Equipment Effectiveness (OEE) and systemic backlogs causing a significant slowdown in customer complaint response times [14]. Left unchecked, physical asset breakdown and customer dissatisfaction will permanently erode brand equity and long-term profit margins [14].

To dismantle this illusion of financial prosperity and secure manufacturing operations, PT XYZ requires a holistic, integrated, and dynamic performance measurement system [14]. This study proposes a comprehensive performance evaluation model combining four prominent methodologies: Balanced Scorecard (BSC), Analytical Hierarchy Process (AHP), Objective Matrix (OMAX), and the Traffic Light System (TLS) [14]. These methods synergetically address each other's theoretical limitations: (1) BSC establishes a balanced, multi-perspective strategy map (Financial, Customer, Internal Business Process, Learning and Growth) [3]; (2) AHP applies mathematically rigorous pairwise comparisons based on expert consensus to resolve executive weighting subjectivity [4]; (3) OMAX standardizes heterogeneous operational metrics (e.g., minutes, percentages, ratios) into a unified 0-10 index [5]; and (4) TLS translates dense calculations into a visual executive dashboard, enabling "Management by Exception" to trigger pro-active Corrective and Preventive Actions (CAPA) [6]. The ultimate goal of this paper is to formulate a tailored system that bridges the research gap of standalone and static evaluation tools in volatile FMCG environments.

2. Method

This study utilizes an integrated mixed-methods action research design. Primary data collection was conducted via a structured Focus Group Discussion (FGD) and Analytical Hierarchy Process (AHP) questionnaires involving five key managerial experts from PT XYZ: the Managing Director (R1), Brand Manager (R2), Production & PPIC Manager (R3), QA/QC Manager (R4), and HR & GA Manager (R5) [14]. These individuals represent the strategic core of the organization, each possessing over 5 years of industry-specific experience [14]. The expert profile table (Table 1) outlines their qualifications and strategic roles in validating the system.

Table 1. Profile of Expert Respondents (Pakar) Involved in the FGD and AHP Weighting

Code	Position / Department	Tenure (Years)	Strategic Validation Role
R1	Managing Director / CEO	> 8 Years	Corporate Vision, Mission & Quality Policy Alignment
R2	Brand Management Manager	> 6 Years	Market Dynamics, Branding & Customer Experience Validation
R3	Production / PPIC Manager	> 7 Years	Manufacturing Workflows, Logistics & Efficiency Validation
R4	QA / QC Manager	> 5 Years	Sistem Manajemen Mutu (ISO 9001:2015) & Product Compliance
R5	HR & GA Manager	> 5 Years	Human Capital Readiness, Training & Staf Retention Validation

Source: PT XYZ Focus Group Discussion (FGD), 2025.

Secondary data was extracted from corporate financial reports, production logs, quality control sheets, and ISO 9001:2015 internal audit checklists spanning the years 2024 (as the historical baseline) and 2025 (as the actual evaluation period) [14]. The system's mathematical modeling was executed in three sequential phases: AHP Weighting, OMAX Scoring, and TLS Visualization [14]. First, AHP pairwise matrices were constructed using Saaty's 1-9 scale to obtain local and global weights [4]. To explain Saaty's 1-9 semantic scale scientifically, Table 2 lists the scale values, definitions, and logical descriptions used during the FGD per comparisons.

Table 2. Saaty's Analytical Hierarchy Process (AHP) 1-9 Pairwise Comparison Scale

Intensity of Importance	Definition	Logical Explanation
1	Equal Importance	Two activities contribute equally to the objective.
3	Moderate Importance	Experience and judgment slightly favor one activity over another.
5	Strong Importance	Experience and judgment strongly favor one activity over another.
7	Very Strong Importance	An activity is favored very strongly over another; its dominance is demonstrated in practice.
9	Extreme Importance	The evidence favoring one activity over another is of the highest possible order of affirmation.

Source: Saaty, 1980 [4].

The consistency of the expert judgments was strictly validated using the Consistency Index (CI) and Consistency Ratio (CR) formulas [4]:

$$CI = \frac{\lambda_{maks} - n}{n - 1} \tag{1}$$

$$CR = \frac{CI}{IR} \tag{2}$$

where λ max represents the maximum eigenvalue, n is the matrix order (number of compared elements), and IR is the Random Consistency Index. Judgments were deemed valid only when

$CR \leq 0.10$ [4]. The values of the Random Index (RI) derived by Saaty based on matrix order size n are summarized in Table 3.

Table 3. Random Consistency Index (RI) Values based on Matrix Size (n)

n Size	1	2	3	4	5	6	7	8	9	10
RI Value	0.00	0.00	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49

Source: Saaty, 1980 [4].

Second, the OMAX model standardizes metrics using three anchor points [5]: Score 10 represents the optimistic target; Score 3 is the historical baseline (2024 actual performance); and Score 0 is the worst acceptable performance level, representing critical operational failure. Linear interpolation was utilized for intermediate score levels [5]. Third, Traffic Light System (TLS) thresholds are defined: Green (Score 8.00–10.00) indicates stable performance needing maintenance; Yellow (Score 4.00–7.99) warrants cautionary pre-emptive review; and Red (Score 0.00–3.99) demands immediate management intervention via CAPA [6]. These ranges convert abstract values into clear, action-oriented indicators.

3. Result and Discussion

3.1 Strategic Objective Mapping and KPI Formulation

Through rigorous FGD sessions and strategic decomposition of PT XYZ's vision ("To be the best e-liquid worldwide and help people live healthier lives"), 20 critical Key Performance Indicators (KPIs) were successfully mapped across the four BSC perspectives [14]. The complete operational definitions, formulas, measurement units, frequency, and responsible person-in-charge (PIC) are detailed in Table 4.

Table 4. Integrated BSC Key Performance Indicators Design for PT XYZ

Perspective	Code	KPI Name	Unit	PIC
Financial	F1	Revenue Growth Rate	%	Sales/Mkt
Financial	F2	Operating Expense Ratio	%	Finance
Financial	F3	Net Profit Margin	%	Finance
Financial	F4	Cash Conversion Cycle	Days	Finance
Financial	F5	Return on Assets (ROA)	%	Finance
Customer	C1	Customer Satisfaction Index	Score	Marketing
Customer	C2	Customer Retention Rate	%	Marketing
Customer	C3	Market Share Percentage	%	Marketing
Customer	C4	Brand Awareness Score	%	Marketing
Customer	C5	Response Time Keluhan	Minutes	Marketing
Internal Process	P1	Defect Rate Produksi	%	QA/QC
Internal Process	P2	Overall Equipment Eff. (OEE)	%	Production
Internal Process	P3	New Product Launches	Variants	R&D
Internal Process	P4	Inventory Turnover	Times	PPIC
Internal Process	P5	Regulatory Compliance Score	%	QA/QC
Learning & Growth	L1	Training Hours / Employee	Hours	HRGA
Learning & Growth	L2	IT System Reliability Rate	%	IT

Perspective	Code	KPI Name	Unit	PIC
Learning & Growth	L3	Employee Engagement Index	Score	HRGA
Learning & Growth	L4	Employee Turnover Rate	%	HRGA
Learning & Growth	L5	Internal Process Improvements	Ideas	All Dept

Source: PT XYZ Focus Group Discussion (FGD), 2025.

3.2 AHP Priority Weighting and Consistency Analysis

3.2.1 Integrated Objective Matrix (OMAX) Scoring

Following the KPI identification, AHP per perspective comparison matrices were compiled. The computed Consistency Ratio (CR) value for the Level 1 perspective matrix is 0.05904, well below the 0.10 threshold, verifying outstanding consistency among the executive board [4]. The prioritized weights for perspectives are shown in Table 5. The extreme dominance of the Financial Perspective (0.48530) and the Customer Perspective (0.28355) indicates that PT XYZ is strategically focused on rapid top-line market penetration and brand defense during its active expansion stage [14]. This is empirically supported by Yeo et al. [11], who verified that commercial and market-driven firms show heavy prioritization towards financial and market metrics to protect margins during scaling.

Table 5. AHP Priority Weightings for Balanced Scorecard Perspectives

BSC PERSPECTIVE	PRIORITY WEIGHT	INCONSISTENCY RATIO (CR)
FINANCIAL PERSPECTIVE	0.48530	0.05904 (Consistent)
CUSTOMER PERSPECTIVE	0.28355	Merged consistency on
LEARNING AND GROWTH PERSPECTIVE	0.13594	expert consensus matrices
INTERNAL BUSINESS PROCESS PERSPECTIVE	0.09521	CR values ≤ 0.10

Source: Data processing based on expert questionnaires, 2025.

A highly noteworthy finding is the relatively low weight assigned to the Internal Business Process Perspective (0.09521) [14]. In traditional manufacturing literature, internal processes carry high weights. However, at PT XYZ, this "anomaly" is scientifically justified by the company's existing ISO 9001:2015 certification [14]. Because the internal processes are standardized and stable, management views them as "hygiene factors" rather than active strategic differentiators, a phenomenon validated by Martín-Gómez et al. [15], who noted that mature SMEs shift strategic priorities to market expansion once quality baselines are locked. To evaluate actual changes, operational performance comparisons between the pre-expansion year (2024 baseline) and the post-expansion year (2025 actual) are consolidated in Table 6.

Table 6. Comparative Performance and Targets Dataset (2024-2025) for PT XYZ

Perspective	Code	Key Performance Indicator (KPI)	Unit	2024 Actual	2025 Actual	Target
Financial	F1	Revenue Growth Rate	%	7.50	12.00	15.00
Financial	F2	Operating Expense Ratio	%	12.50	11.20	10.00
Financial	F3	Net Profit Margin	%	12.00	14.50	20.00

Perspective	Code	Key Performance Indicator (KPI)	Unit	2024 Actual	2025 Actual	Target
Financial	F4	Cash Conversion Cycle	Days	45	40	30
Financial	F5	Return on Assets (ROA)	%	5.00	6.80	10.00
Customer	C1	Customer Satisfaction Index	Score	3.80	4.20	4.50
Customer	C2	Customer Retention Rate	%	65.00	72.00	80.00
Customer	C3	Market Share Percentage	%	15.00	18.50	25.00
Customer	C4	Brand Awareness Score	%	50.00	58.00	70.00
Customer	C5	Response Time Keluhan	Min	30.0	35.0	10.0
Internal	P1	Defect Rate Produksi	%	1.00	0.85	0.50
Internal	P2	Overall Equipment Effectiveness	%	70.00	65.00	85.00
Internal	P3	New Product Launches	Units	2	4	5
Internal	P4	Inventory Turnover	Times	8	10	12
Internal	P5	Regulatory Compliance Score	%	95.00	100.00	100.00
Learning	L1	Training Hours / Employee	Hours	20	25	40
Learning	L2	IT System Reliability Rate	%	98.00	99.50	99.90
Learning	L3	Employee Engagement Index	Score	3.20	3.50	4.00
Learning	L4	Employee Turnover Rate	%	5.00	4.20	2.00
Learning	L5	Internal Process Improvements	Ideas	5	8	15

Source: Compiled corporate reports and performance logs, 2024-2025.

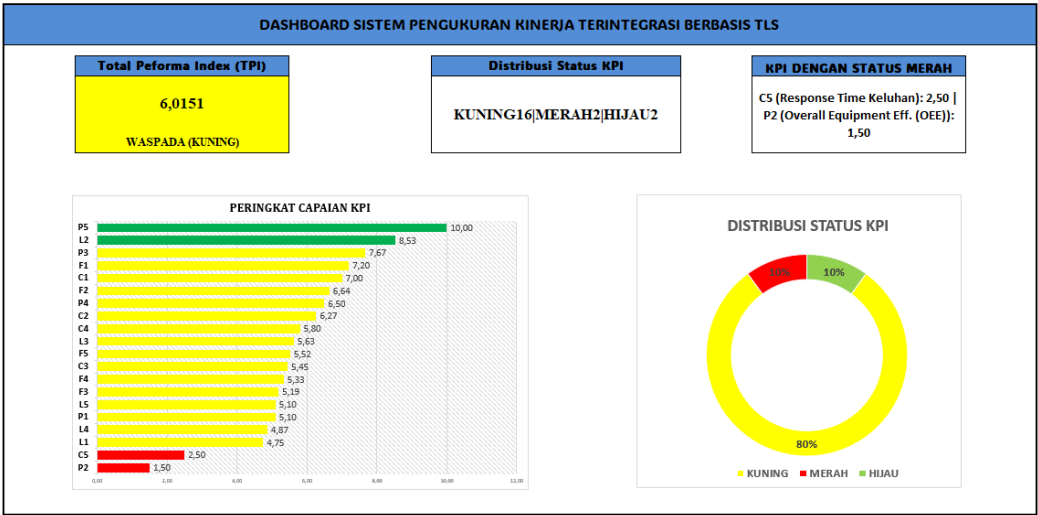
To compute the standardized indices, the global weights and 2025 actual performance figures were mapped onto the OMAX matrix. A standard scaling model with three main anchor points (10: Optimistic Target, 3: 2024 Baseline, 0: Worst/Critical Failure Point) was applied based on Riggs and Felix [5]. Linear interpolation was conducted to determine scores for actual performance figures sitting between anchor values. Standardizing heterogeneous metrics into a uniform 0-10 scale represents a major advantage for tracking fragmented manufacturing operations [10]. The complete OMAX evaluation matrix for the fiscal year 2025 is presented in Table 7.

Table 7. Completed OMAX for PT XYZ (Fiscal Year 2025)

Perspective	Code	KPI	Weight	Actual	Target (10)	Baseline (3)	Worst (0)	Score	Value
Financial	F1	Revenue Growth Rate	0.1982	12.0%	15.0%	7.5%	0.0%	7.2	1.4270
Financial	F2	Operating Expense Ratio	0.0700	11.2%	10.0%	12.5%	15.0%	6.6	0.4620
Financial	F3	Net Profit Margin	0.0643	14.5%	20.0%	12.0%	5.0%	5.2	0.3344
Financial	F4	Cash Conversion Cycle	0.0435	40 Days	30 Days	45 Days	60 Days	5.3	0.2305
Financial	F5	Return on Assets (ROA)	0.1092	6.8%	10.0%	5.0%	0.0%	5.5	0.6006
Customer	C1	Customer Satisfaction	0.1066	4.20	4.5	3.8	3.0	7.0	0.7462
Customer	C2	Customer Retention Rate	0.0609	72.0%	80.0%	65.0%	50.0%	6.3	0.3837
Customer	C3	Market Share Percentage	0.0609	18.5%	25.0%	15.0%	5.0%	5.4	0.3289
Customer	C4	Brand Awareness Score	0.0208	58.0%	70.0%	50.0%	30.0%	5.8	0.1206
Customer	C5	Response Time Keluhan	0.0343	35.0 m	10.0 m	30.0 m	60.0 m	2.5	0.0857
Internal	P1	Defect Rate Produksi	0.0385	0.85%	0.50%	1.00%	2.00%	5.1	0.1964

Perspective	Code	KPI	Weight	Actual	Target (10)	Baseline (3)	Worst (0)	Score	Value
Internal	P2	Overall Equipment (OEE)	0.0242	65.0%	85.0%	70.0%	60.0%	1.5	0.0363
Internal	P3	New Product Launches	0.0158	4 Unit	5 Unit	2 Unit	0 Unit	7.7	0.1217
Internal	P4	Inventory Turnover	0.0061	10 Kali	12 Kali	8 Kali	4 Kali	6.5	0.0397
Internal	P5	Regulatory Compliance	0.0107	100.0%	100.0%	95.0%	90.0%	10.0	0.1070
Learning	L1	Training Hours / Employee	0.0212	25 Jam	40 Jam	20 Jam	0 Jam	4.8	0.1018
Learning	L2	IT System Reliability	0.0241	99.5%	99.9%	98.0%	95.0%	8.5	0.2048
Learning	L3	Employee Engagement	0.0468	3.50	4.0	3.2	2.5	5.6	0.2621
Learning	L4	Employee Turnover Rate	0.0214	4.2%	2.0%	5.0%	10.0%	4.9	0.1049
Learning	L5	Internal Process Improv.	0.0225	8 Ide	15 Ide	5 Ide	0 Ide	5.1	0.1148
TOTAL		Total Performance Index (TPI)	1.0000						6.0091

Source: Calculated based on 2025 actual results and AHP-OMAX integration models [14].



Source: Matlab/Matplotlib execution output based on 2025 OMAX scoring [14].

Figure 1. Standardized OMAX Scores and TLS Status for 20 KPIs (PT XYZ, 2025)

3.2.2 Traffic Light System Mapping & Critical Bottlenecks

As computed in Table 7, the Total Performance Index (TPI) of PT XYZ for fiscal year 2025 is 6.0091. This aggregates to placing the overall corporate performance under the Yellow (Cautionary) Zone, according to the managerial thresholds [14]. Under this multi-criteria framework, the TPI shows a substantial +42.99% expansion relative to the 2024 historical baseline (stagnant score of 3.0000) [14]. However, a critical pitfall of aggregate indices is their susceptibility to a "masking effect," where positive macro-indicators obscure deep-seated operational breakdowns [14]. A deconstruction of the individual KPI scores under the TLS rules shows a highly polarized distribution. Farah Afifah et al. [6] and Arsetyo [13] emphasized that

a structured, color-coded dashboard is essential for Top Management to apply "Management by Exception" to immediately separate mediocre/safe scores from emergency operational alerts. Table 8 details this TLS distribution and the standardized managerial protocols.

Table 8. TLS Distribution and Standardized Managerial Response Protocols

Score Range	Status Color	Performance	KPI Count (%)	Managerial Interpretation & Mandated Protocol
8.00-10.00	GREEN	Superior / Target Met	2 (10%)	Sustenance: Standardize success into "best practices." Grant corporate rewards to division.
4.00-7.99	YELLOW	Cautionary / Stagnant	16 (80%)	Pre-emptive Analysis: Conduct monthly review and trend monitoring. Prevent degradation to Red Zone.
0.00-3.99	RED	Critical / Failure	2 (10%)	Emergency Intervention: Direct executive intervention. Immediate Root Cause Analysis (RCA) and CAPA.

Source: PT XYZ standard TLS response guidelines, 2025.

The deconstruction reveals that while 80% (16 KPIs) of the company's activities reside in the stable Yellow Zone, two critical anomalies are detected in the Red Zone [14]. First, Overall Equipment Effectiveness (OEE / P2) has collapsed to a score of 1.5, representing an actual performance of only 65.0% against the 85.0% target [14]. Second, Customer Complaint Response Time (C5) deteriorated to a score of 2.5, corresponding to an actual response time of 35.0 minutes against the 10.0-minute target [14]. These findings confirm the "Growing Pains" hypothesis: aggressive sales expansion has created "systemic fatigue" over-utilizing production assets and overwhelming customer service capacities [14]. Under Goldratt's Theory of Constraints (TOC) [7], any system's throughput is limited by its weakest link, which in this case represents physical assets (OEE) and service speed (Response Time).

3.2.3 Managerial Implications and Corrective & Preventive Actions (CAPA)

To remedy these bottlenecks and prevent systemic failure, the following coordinated CAPA strategies are mandated for immediate implementation:

1. Financial Reinvestment (Capital Expenditure): The executive board must withhold a percentage of dividend payouts to fund capital expenditure (CAPEX) for additional liquid filling and automated mixing units. Expanding physical capacity will directly reduce the over-utilization of existing machinery, returning the operational load to engineered tolerances [14].
2. Total Productive Maintenance (TPM): The production and engineering departments must transition from reactive to proactive maintenance by implementing autonomous maintenance protocols. Shopfloor operators must be trained to conduct routine daily checks, lubrication, and calibration. This transition is theoretically aligned with Silaban et al. [10], who demonstrated that integrating autonomous maintenance on the shopfloor significantly cuts unplanned downtime and elevates OEE. Standardized "Planned Downtime" must be

- strictly scheduled; the organization must dictate when machines are shut down for maintenance, rather than letting machines force catastrophic unscheduled breakdowns [14].
3. Customer Service Digitalization: To eliminate the bottleneck in complaint response times, PT XYZ must implement an omnichannel Customer Relationship Management (CRM) system integrated with artificial intelligence (AI) chatbots. Automated routing and instant resolution for routine requests will reduce response times by up to 80%, allowing human agents to focus on complex distributor disputes, thereby pulling C5 back to the Green Zone [14].
 4. Human Capital Alignment: The HR department must redesign its training curriculum to bridge the current gap between high-tech IT systems (L2) and low-skilled operators (L1). Focus training programs strictly on engineering-level machine calibration, autonomous maintenance, and advanced customer service grievance resolution [14]. As suggested by Vărzaru [12], strategic alignment between information capital (ERP systems) and human capital (targeted skills training) is vital to secure the sustainable benefits of a Balanced Scorecard framework.

4. Conclusion

This study successfully constructs an integrated, closed-loop performance measurement system for PT XYZ, combining BSC, AHP, and OMAX with visual TLS dashboards. The system translates abstract corporate vision into 20 actionable KPIs, validated and weighted consistently under AHP ($CR < 0.10$). In fiscal year 2025, PT XYZ achieved an aggregate Total Performance Index (TPI) of 6.0091, indicating a moderate improvement of +42.99% from the 2024 baseline. Although the aggregate corporate status is Yellow (Cautionary), the TLS visual dashboard successfully bypassed the "masking effect" to expose two critical Red Zone bottlenecks: P2 (Overall Equipment Effectiveness) at a critical score of 1.5, and C5 (Response Time Keluhan) at 2.5. This diagnosis confirms that the company's rapid sales expansion has induced systemic fatigue across its internal production assets and customer support channels. Immediate execution of the proposed CAPA strategies specifically implementing TPM, digitalizing the CRM system, and aligning capital expenditures is highly recommended to sustain PT XYZ's competitive advantage in the global e-liquid market.

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