

Analysis Of Quality Management And Product Design Problems Of Pt L'essential Towards Customer Satisfaction

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Abstract

This research aims to analyze the quality management and product design issues faced by PT L'Essential and their impact on customer satisfaction. The main problems identified include a high rate of product defects, particularly in packaging such as leaking bottles and pump malfunctions, as well as a mismatch between packaging design and consumer expectations. To address these issues, a qualitative approach was employed through direct observation, semi-structured interviews, and the use of company data to support theoretical analysis. Analytical tools used include production process flowcharts, cause-and-effect diagrams, Pareto charts, and design-focused methods such as Quality Function Deployment (QFD) and Fault Tree Analysis (FTA) to identify root causes of design failures. The findings reveal that 70% of total product defects stem from two major types of failures: leaking bottles and pump malfunctions, which directly affect stock accuracy and distribution flow. The production yield rate was recorded at 93.63% with a productivity level of 5.85 units per hour, while the quality productivity ratio was only 23.25%, indicating untapped efficiency potential. The managerial implications of these findings highlight the need to strengthen quality control at the early stages of production, redesign packaging based on customer needs, and provide ongoing employee training. These strategies are expected to reduce defect rates, enhance operational efficiency, and strengthen customer loyalty toward PT L'Essential brand in the competitive skincare market.

Keywords: Quality management, Product design, Customer satisfaction, Product defects, Production efficiency.

INTRODUCTION

In this research, the analysis focuses on issues related to the quality of product raw materials and packaging which are the main challenges for PT L'Essential because they have a direct impact on customer satisfaction and the smoothness of the company's production process. As the skincare industry becomes increasingly competitive, PT L'Essential faces increasing pressure to maintain product quality and adapt product designs to increasing customer expectations. Common operational issues include inconsistencies in the quality of raw materials, packaging that does not match customer brand expectations, product expiration and materials that do not meet standards that can affect product distribution.

These issues significantly impact customer satisfaction, which is a key indicator of success in the skincare business. According to quality management theory, quality is not only judged by the final product but also by the entire production process, starting from planning, quality control, to evaluation. Meanwhile, product design theory emphasizes that a product must not only fulfill its basic function but also offer aesthetic value, user-friendliness, and consumer appeal. Based on quality management theory, poor product quality during production can lead to increased customer complaints, product returns, and a loss of consumer loyalty (Evans & Lindsay, 2017). In addition, product design that does not meet the needs of the target market can diminish the perceived value of the product, even if the active ingredients used are of high quality (Ulrich & Eppinger, 2016).

This research applies the Measuring Product Yield and Productivity approach to evaluate whether the company is utilizing its resources efficiently to produce high-quality products in optimal quantities. It also aims to analyze the root causes of low yield or productivity and formulate solutions based on quality management theory. Furthermore, the Computing Product Cost per Unit approach is essential to determine the actual cost required to produce a single unit of product. In a highly competitive skincare industry, production cost efficiency can provide a competitive edge. This approach also helps identify the root causes of product defects that often occur during production. The use of quality management and product design theories is crucial in the context of PT L'Essential, as these two aspects form the foundation of how consumers perceive a skincare brand. By understanding the core issues through the lens of these theories, the company can design more targeted improvement strategies to enhance service quality and customer satisfaction.

In addition, this study was conducted with the aim of analyzing the problems in quality management and product design faced by PT L'Essential and its relationship to customer satisfaction. In addition, this study attempts to identify sources of inefficiency and misalignment in the production process and product design that can affect consumer perceptions of quality. This study also attempts to measure the relationship between

product quality and design with customer satisfaction through qualitative approaches. Thus, the results of this study are expected to provide relevant strategic recommendations for PT L'Essential to improve product quality, design effectiveness, and overall customer loyalty.

LITERATURE ANALYSIS

Company Background

L'essential is a beauty company that has been operating since 2004. Since its inception, the company has been committed to providing high-quality skincare products that are safe and effective for various skin types. And one of their products that focuses on their skincare products is the "Acne series" and "Oil Control". This commitment is supported by strategic collaborations with renowned dermatology professors and skin experts, which allows L'essential to continue to engage in scientific research and development. Through this partnership, the company has been able to formulate innovative products that meet the growing needs of consumers in both domestic and international markets.

In addition to producing and marketing products under its own brand, L'essential also offers cosmetic contract manufacturing (OEM/ODM) services. This service caters to individuals, startups, and companies looking to launch their own beauty brands. L'essential supports its clients through every stage of the product development process from concept planning and ingredient selection to formulation, packaging design, and regulatory approval from the Food and Drug Supervisory Agency (BPOM). With over two decades of industry experience, L'essential has become a trusted partner in the local beauty industry for its ability to deliver high-quality products and professional and efficient production services.

As part of its commitment to safety and inclusivity, L'essential ensures that its products are produced according to Halal standards. The company has obtained Halal certification from authorized institutions, guaranteeing that all ingredients and production processes comply with Islamic law. This certification not only supports the needs of Muslim consumers but also reinforces the brand's dedication to transparency, hygiene, and ethical manufacturing practices.

As consumer awareness of skincare and demand for safe, natural, and effective beauty products increases, L'essential remains committed to continuous innovation. The company continues to develop not only its product formulas and production technology, but also its business model to stay in line with modern beauty trends. L'essential positions itself as a pioneer in providing clinically effective, environmentally friendly, Halal-certified, and sustainable beauty solutions. In addition, as a company that focuses on beauty, it requires quality packaging that meets consumer standards and desires. Therefore, the quality

management and product design approach can be a further study to contribute to the development of a more efficient business strategy for the company.

Theory of Quality Management

Quality Management is an activity of supervising activities and tasks to maintain the quality level of the product. This includes determining quality policies, creating and implementing quality planning and assurance, and quality control and quality improvement. Quality also serves to meet needs and provide value to consumers. According to W. Edwards Deming, in a production process a consumer is the most important part, so the quality of a product must align with consumer needs, present and future. Therefore, quality is defined as "*fitness for its intended use*". Supported by the business philosophy that the long-term success of a company comes from customer satisfaction and loyalty. From a producer's perspective, quality focuses on ensuring that a product meets the specifications required by the design. If it does not meet the design, the product or service may not perform as well and may disappoint customers, affecting their satisfaction and brand trust. While manufacturers may focus on keeping costs low, customers care more about how well the product or service meets their needs at a reasonable price.

The quality of manufactured goods is influenced by several interrelated factors. Performance refers to the basic function of a product, Features are additional attributes that make it more useful. Reliability is the length of time a product will perform consistently according to product specifications. Conformance measures how well a product meets specifications, Durability reflects how long a product lasts before it needs to be replaced, and Serviceability relates to how easily the product can be repaired. Aesthetics include contributions to a company's identity, such as its look, feel, and sound, while Safety ensures the product is safe to use. Perceptions represent subjective feelings and opinions about the product. Meanwhile, service quality focuses on the customer experience, including timeliness of service delivery, completeness, courtesy, consistency, accessibility & convenience, responsiveness to customer needs, and accuracy in delivering promised services.

Total Quality Management is a management system for customer-focused companies that involves all employees in the continuous improvement of the organization. It is an integrative system that uses strategy, data, and effective communication to integrate disciplines through the system into the processes, products, services, and culture of the organization. Simultaneously, a Quality Management System (QMS) is a structured framework to ensure products or services meet regulatory and customer requirements. QMS is a key component of long-term profitability and operational performance since it

156

integrates well with other business systems. The principles of Total Quality Management emphasize that quality must be managed intentionally, not left to chance. Quality is defined by the customer and requires clear leadership from management. In addition, TQM emphasizes that quality problems originate in the process, not in individuals. The ultimate goal is zero defects, and achieving this requires a robust measurement system to track performance and guide improvement.

The Plan-Do-Study-Act (PDSA) cycle or can be called the Deming Wheel is a model that helps organizations make continuous improvements. Demil Wheel functions to optimize the company's work and encourage improvements in employee capabilities. A useful tool for increasing customer satisfaction, achieving higher quality, reducing waste, reducing cost, increasing productivity, and reducing processing time.

Quality Control uses a variety of tools to help troubleshoot and improve processes. There are several tools that companies use to solve problems and find processes that need improvement using flowcharts that visually map out the process, making it easier to spot errors. A cause-and-effect diagram (a fishbone or Ishikawa diagram) helps find possible causes of a problem. Check sheets are simple forms used to collect and organize data, like tracking types or locations of product defects. Pareto analysis focuses on the most important issues, based on the idea that a few causes often lead to most problems commonly called the 80/20 rule. A histogram shows how data is distributed, helping detect patterns. Scatter diagram helps identify if two variables are related. Control charts track whether a process is stable or if something unusual is happening.

Customer satisfaction is the foundation of quality management. The goal of strategies such as Total Quality Management and Quality Management Systems is to ensure that customer demands and expectations are continually met or exceeded. Customers are less likely to switch to competitors if they are satisfied, which has major financial implications. Since it costs five to six times more to acquire a new customer than to retain an existing one, retaining existing customers is far more cost-effective than acquiring new ones.

Active employee participation in problem identification and resolution is a key factor in quality improvement. Companies have made significant investments in employee education. The problem-solving process typically begins with identifying the problem, collecting and analyzing data, brainstorming possible solutions, and reaching group consensus on the best course of action. Once a solution is selected, it is implemented and monitored to ensure its effectiveness. Structured analysis, appropriate training, and group dynamics are all important to this process. Kaizen, which refers to continuous improvement projects conducted by volunteer teams called quality circles, is a well-known approach within this framework.

The cost of quality must be taken into account when evaluating the financial impact of quality. The costs of achieving good quality and the costs of poor quality are two major categories that are usually separated. The purpose of prevention costs, such as costs incurred during the design phase, is to stop defects before they occur. The “Cost of Achieving Good Quality” which includes appraisal costs, which are costs used to measure, test, and analyze product quality. There are internal failure costs caused by defects discovered before the product is shipped to the customer. There are external failure costs, which include missed sales, product returns, warranty claims, and complaints. By investing in prevention and assessment, companies can significantly reduce the costly consequences of internal and external failures, ultimately increasing customer satisfaction and profitability.

Using the Measuring Product Yield and Productivity approach is a method to evaluate the efficiency and effectiveness of the production process on their resources to produce quality products in optimal quantities. In addition, the use of the Computing Product Cost per Unit approach to determine the costs incurred to produce one unit of product. Companies also need a Quality–Productivity Ratio to measure whether the company can produce quality products with optimal productivity levels.

Theory of Product Design

Product design is a strategic function that matches customer requirements with technical solutions. It plays a critical role in gaining a competitive advantage by minimizing development time, reducing revisions, and delivering products that meet or exceed expectations.

The design process starts by gaining a clear understanding of the customer and identifying their specific needs. New product ideas or enhancements to current offerings can originate from a variety of sources, such as a company’s research and development team, feedback from customers, market research, suppliers, sales representatives, factory staff, and advancements in technology. Competitors can also serve as inspiration for new product or service ideas. Tools like perceptual mapping, benchmarking, and reverse engineering enable businesses to learn from their rivals.

The design process is a systematic approach that aims to align the features and characteristics of a product or service with customer requirements. It emphasizes simplification to reduce costs and minimize the time and effort required for revisions. This process begins with idea generation, which can stem from various sources such as internal R&D, customer suggestions, competitive analysis, supplier input, and technological advancements. Following this, a feasibility study is conducted to assess the product’s performance potential, technical viability, economic implications, and market demand. The

use of rapid prototyping and concurrent design further enhances efficiency by allowing teams to test, refine, and develop product concepts simultaneously across departments, reducing time-to-market.

Reliability in product design refers to the likelihood that a product will function as intended over a specific period without failure. Maintainability, on the other hand, measures how easily and quickly a product can be repaired when issues arise. Techniques to enhance these attributes include the use of redundant (parallel) components and calculations of metrics such as Mean Time Between Failures (MTBF) and System Availability. These strategies ensure that products are both durable and serviceable, which is crucial for customer satisfaction and operational efficiency.

To ensure product quality and reliability, several analytical tools are employed. Failure Mode and Effects Analysis (FMEA) identifies potential failure points, their causes, and their consequences, and proposes corrective actions to mitigate risks. Fault Tree Analysis (FTA) provides a visual representation of how different failures are interconnected, helping trace problems to their root causes. Value Analysis (VA) evaluates the cost and function of each component to eliminate unnecessary features and optimize the product's value-to-cost ratio.

Quality Function Deployment (QFD) is a method that transforms customer input into technical design specifications using a series of matrix diagrams that resemble linked houses. The first of these, known as the House of Quality, serves to convert customer expectations into specific product design features. This matrix includes six key components: customer requirements, competitive assessment, design characteristics, a relationship matrix, a trade-off matrix, and a section for target values. Managers use this structure to define design targets that aim to fulfill or surpass customer expectations.

METHODOLOGY

This research employs a qualitative study approach combined with fictional data simulation to examine the issue of stock and product defects at PT L'Essential. The main objective of this research is to analyze operational problems, particularly those related to the occurrence of defective products that affect stock accuracy and efficiency. The qualitative approach allows the researcher to deeply explore the operational aspects within the company, including work patterns and quality control procedures. By integrating this qualitative insight with theoretical simulation, the research aims to provide a comprehensive model that combines concepts from Operations Management and Product Design, not only describing the existing problems but also offering practical and theoretical solutions.

Product defects serve as a central issue in this study, as they contribute to the accumulation of unsellable inventory, inconsistencies between system data and actual warehouse stock, and interruptions in the distribution process to end consumers. Therefore, understanding the root causes and impacts of product defects is critical. Through qualitative exploration, the researcher seeks to identify critical points in the production and logistics flow that lead to the occurrence of defects, and further investigate opportunities for improvement using principles of continuous improvement and process redesign.

The data collection methods used in this research include direct observation and semi-structured interviews. Observations were conducted at PT L'Essential warehouse to directly observe the storage procedures, quality checks, and handling processes. This observation serves as a foundation for contextual understanding prior to deeper theoretical analysis. In addition to observations, online interviews were conducted via Zoom with Mr. Usri, the Warehouse Manager of PT L'Essential, who is directly responsible for inventory control and product quality oversight. The interview explored in depth the company's Standard Operating Procedures (SOPs), challenges in quality control implementation, and internal insights into the root causes of product defects. The discussion also touched on system limitations in identifying and managing defects, as well as internal suggestions for improving existing workflows.

The observation session took place on Tuesday at 2:00 PM at PT L'Essential office and warehouse, located at Jalan Pergudangan Industri Taman Tekno BSD, Jl. Sektor 11 No.3A, Setu, Setu District, South Tangerang City, Banten 15314. Meanwhile, the interview session was conducted online via Zoom on Thursday, the 10th, at 10:00 AM. The chosen time and location were carefully arranged to minimize disruption to operational activities and to allow for accurate and timely data collection from key personnel.

By combining qualitative methods with theoretical simulation, this study aims to deliver insightful and actionable analysis, particularly in formulating effective solutions to address the problem of product defects and stock inconsistencies that impact the overall operational performance of PT L'Essential. With the presence of two popular L'Essential products, namely the Acne Series and Oil Control skincare products.

<i>Year</i>	<i>Acne Series</i>	<i>Number of Defects</i>	<i>Percentage (%)</i>	<i>Oil Control</i>	<i>Number of Defects</i>	<i>Percentage (%)</i>	<i>Total Production</i>
2022	580.000	2.520	43,00	620.000	3.850	62,00	1.200.000
2023	610.000	2.310	38,00	590.000	3.670	62,00	1.200.000

2024	570.000	2.710	48,00	630.000	3.420	54,00	1.200.000
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Source : Internal company data (2025)

RESEARCH AND RESULTS

Quality Management Data Analysis

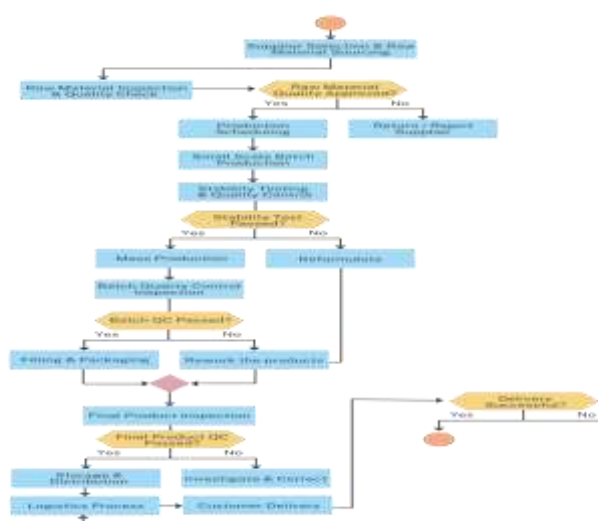
Quality Tools

Process Flow Chart

The production process at PT L'essential begins with supplier selection and raw material sourcing. Once materials are sourced, they undergo raw material inspection and quality check. If the raw materials are approved, the process moves to production scheduling; if not, the materials are returned or rejected to the supplier. After scheduling, the team carries out small scale batch production, followed by stability testing and quality control. If the product passes the stability test, it proceeds to mass production; if not, the formulation is reformulated.

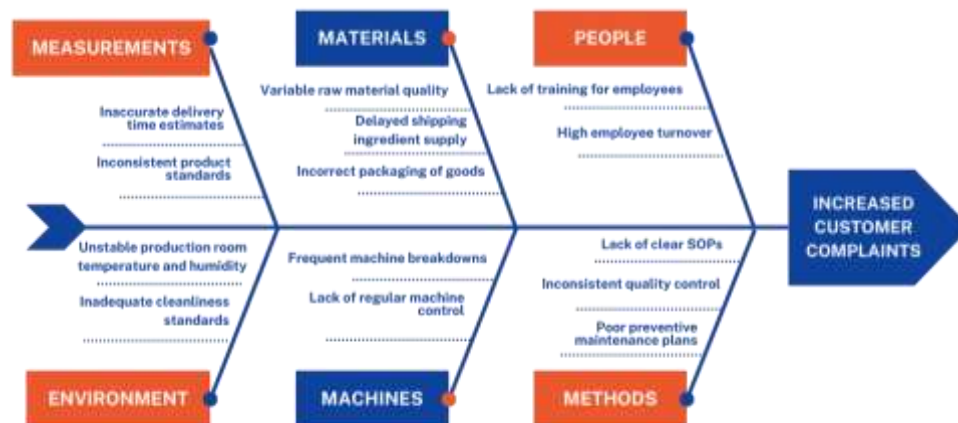
Following mass production, a batch quality control inspection is conducted. If the batch passes, it advances to filling and packaging, if not, the products are reworked. After packaging, a final product inspection takes place. If the final product passes, it moves to storage and distribution. If the final inspection fails, the product is sent to the investigate and correct stage.

After distribution, the logistics process delivers the products to customers. A final decision point checks if the delivery is successful. If delivery is successful, the process concludes. If not, it loops back for correction and re-delivery to ensure the customer receives the product.



Cost and Effect diagram

The primary categories identified are Measurements, Materials, People, Environment, Machines, and Methods. Under Measurements, the key issues are inaccurate delivery time estimates and inconsistent product standards. Materials-related problems include variable raw material quality, delayed shipping of ingredients, and incorrect packaging of goods. In the People category, the main concerns are a lack of employee training and high employee turnover. Environmental factors contributing to the problem include unstable production room temperature and humidity, along with inadequate cleanliness standards. With regard to Machines, frequent breakdowns and the absence of regular machine control are highlighted. Finally, the Methods category points to the lack of clear standard operating procedures (SOPs), inconsistent quality control, and poor preventive maintenance plans. Each of these elements collectively contributes to the escalation of customer complaints.



Check sheet

The checklist displays comprehensive production and defect data collected from internal company records throughout the year. The data is organized by month, starting in January and ending in December, and is further broken down into five production periods for each month, labeled I, II, III, IV, and V.

For each production period, several key metrics are recorded. The table presents the total production volume, which indicates the number of units produced during each period. In addition, the data details the number of defects, which are categorized into five types:

Leaking Bottles, Incorrect Labeling, Broken Seals, Missing Materials List, and Pump Failure. These categories highlight specific quality issues encountered during production.

The total number of defects for each period is calculated by summing the five types of defects. Next, the percentage of defects is provided, which represents the proportion of defective products relative to total production. The percentage of defects remains relatively stable across months, generally ranging between 0.10% and 0.12%.

Production Month		Total production	Number of Defects					Total Defect	Percentage (%)
			Leaking Bottles	Incorrect Labeling	Broken Seals	Missing Ingredient s List	Pump Malfunction		
January	I	20.154	48	12	4	21	34	119	0,59
	II	19.614	41	13	5	21	31	111	0,56
	III	19.525	48	16	4	20	36	124	0,63
	IV	20.259	38	13	4	17	23	95	0,46
	V	19.781	46	16	4	20	23	109	0,55
February	I	19.750	48	16	7	17	37	125	0,63
	11	19.728	47	12	4	17	36	116	0,59
	11I	19.642	43	9	5	17	35	109	0,55
	1V	20.254	39	7	7	16	35	104	0,51
	V	19.604	43	11	6	16	37	113	0,57
March	I	20.192	46	14	7	16	38	121	0,60
	II	20.258	42	11	6	12	33	104	0.51
	III	20.413	39	12	0	18	31	100	0.49
	IV	20.058	41	12	7	18	35	113	0.56
	V	19.589	48	9	5	14	22	98	0.50
April	I	20.104	41	9	4	20	32	106	0.53
	11	19.932	46	8	5	19	36	114	0.57

	1I1	19.532	42	11	5	21	35	114	0.58
	1V	19.530	38	8	4	18	36	104	0.53
	V	19.595	42	7	5	20	35	109	0.55
Mei	I	19.723	41	10	7	0	34	92	0.46
	11	19.738	40	9	5	17	38	109	0.55
	1I1	20.017	46	9	8	19	36	118	0.58
	1V	20.116	43	8	5	20	37	113	0.56
	V	19.527	39	7	4	17	32	99	0.50
June	I	20.074	48	10	8	16	36	118	0.58
	11	19.703	44	16	7	20	34	121	0.61
	III	20.233	46	7	4	21	38	116	0.57
	1V	20.165	42	9	4	18	36	109	0.54
	V	20.218	26	10	4	21	34	95	0.46
July	I	20.058	46	8	8	16	34	112	0.55
	II	19.929	48	11	8	17	0	84	0.42
	III	19.725	43	8	8	0	30	89	0.45
	IV	19.959	47	9	7	16	31	110	0.55
	V	20.103	43	9	5	16	33	106	0.52
August	I	19.784	47	7	6	21	0	81	0.40
	II	20.328	39	11	5	0	37	92	0.45
	III	20.390	46	8	7	20	36	117	0.57
	IV	19.506	41	11	5	21	34	112	0.57
	V	20.277	44	9	7	20	37	117	0.57
September	I	20.325	39	15	5	16	35	110	0.54
	II	19.663	38	13	10	17	33	111	0.56

	III	20.214	38	15	4	17	31	105	0.51
	IV	19.932	38	12	4	0	33	87	0.43
	V	19.848	42	10	7	20	32	111	0.55
October	I	19.784	47	10	7	17	37	118	0.59
	II	19.659	44	12	8	16	36	116	0.59
	III	19.720	43	11	7	19	30	110	0.55
	IV	20.480	48	10	4	19	0	81	0.39
	V	20.281	39	10	5	17	38	109	0.53
November	I	19.844	45	14	10	0	34	103	0.51
	II	19.604	45	11	8	19	38	121	0.61
	III	19.594	39	10	4	16	31	100	0.51
	IV	19.889	41	11	4	19	37	112	0.56
	V	19.599	41	15	0	17	36	109	0.55
December	I	19.867	38	10	1	19	34	102	0.51
	II	20.367	44	8	0	17	33	102	0.50
	III	19.852	42	7	1	0	38	88	0.44
	IV	20.118	38	8	4	16	0	66	0.32
	V	19.770	34	13	6	0	38	91	0.46
Rata-Rata		19,92	42,47	10,62	5,32	15,92	31,85	106.17	9.14774647 88732

Source : Internal company data (2025_

Histogram

The histogram illustrates the number of product defects by PT L'Essential, categorized into five types. "Leaking Bottles" is the most significant defect, with a number 2548, standing out clearly as the tallest bar. Following that, "Pump Malfunction" shows a high defect count as well, close to 1911 cases, indicating it is the second major issue. "Missing Ingredients List" is the third highest, with 1000 cases, showing a noticeable but smaller problem compared to the first two. "Incorrect Labeling" has fewer occurrences, slightly

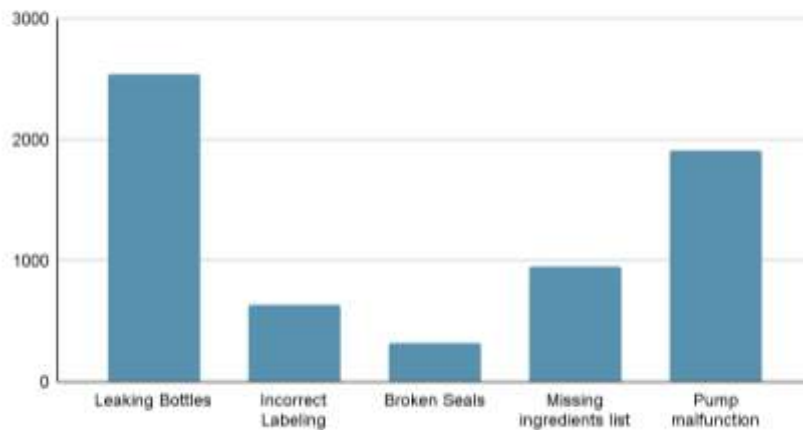
165

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Histogram of Product Defects PT L'Essential



above 600 cases, while "Broken Seals" represents the smallest defect category, with numbers around 300. Overall, the histogram visually emphasizes that most defects are concentrated in leaking bottles and pump malfunctions, while issues like broken seals and incorrect labeling are relatively minor in comparison

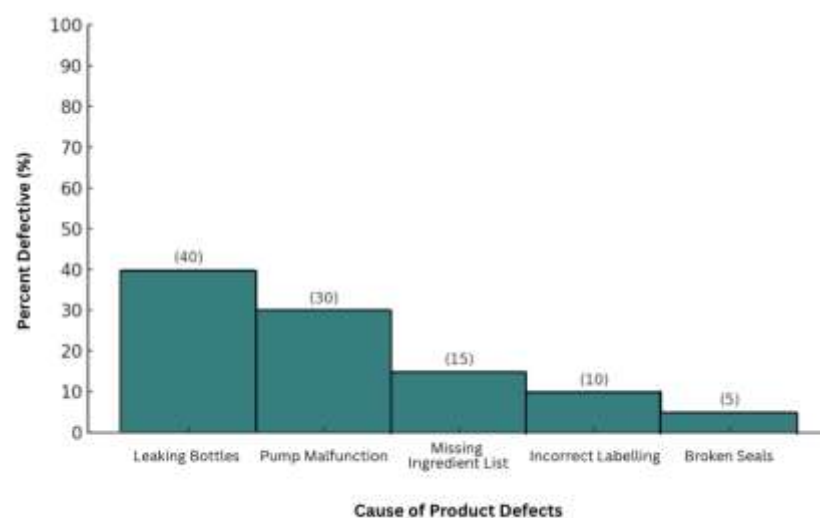
Pareto Analysis

The analysis categorizes defects into five types: leaking bottles, incorrect labeling, broken seals, missing ingredients list, and pump malfunction. According to the table, leaking bottles represent the largest proportion of defects, accounting for 40% of the total, followed by pump malfunctions at 30%, missing ingredients lists at 15%, incorrect labeling at 10%, and broken seals at 5%.

<i>Defect Type</i>	<i>Number of Defect</i>	<i>Percentage</i>
Leaking Bottles	2548	40%
Incorrect Labeling	637	10%
Broken Seals	319	5%
Missing ingredients list	955	15%
Pump malfunction	1911	30%
	6370	100%

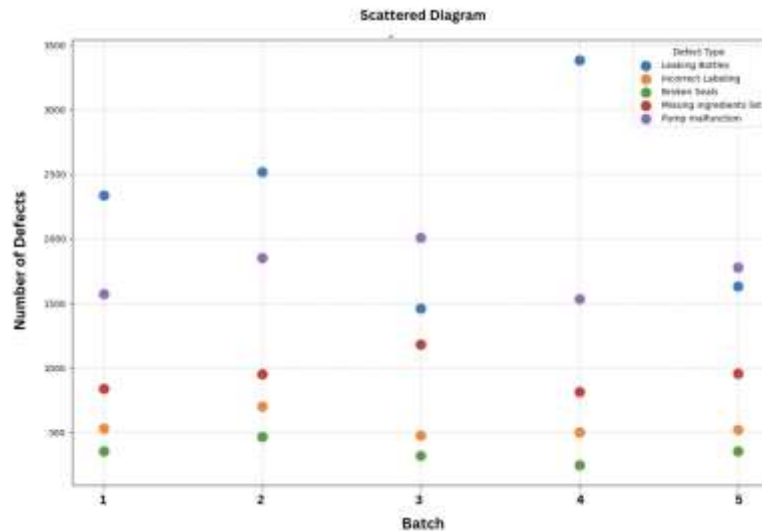
Pareto Chart

The Pareto chart visually illustrates by displaying the percentage of defects for each category in descending order. It highlights that leaking bottles and pump malfunctions are the dominant sources of defects, together comprising 70% of all reported issues. This visual prioritization indicates that addressing these two defect types could potentially lead to the most significant improvement in product quality. The analysis and chart together provide a clear overview of defect distribution, helping to identify key areas for corrective action.



Scatter Diagram

The scatter diagram shows the number of defects for each type across five production batches at PT L'Essential, with a deliberately wider variation to better capture process fluctuations. Each point represents the number of defects found in a batch for a specific defect type, such as leaking bottles or pump malfunctions. The spread of the points indicates that defect counts vary noticeably from batch to batch, suggesting instability in the production process. Higher scatter, especially in critical defects like leaking bottles and pump malfunctions, highlights the need for improved quality control and consistent process monitoring to maintain product reliability and customer satisfaction.



Statistical Process Control Chart

Batch	Defect Count
I	1250 (1356)
II	1270
III	1260
IV	1320
V	1270
Total	6370

- **Mean (Average)**

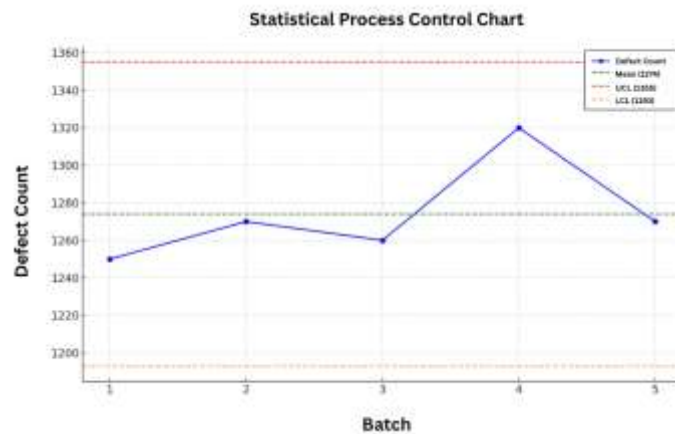
- $\frac{(1250 + 1270 + 1260 + 1320 + 1270)}{5} = 1274$

- **Standard Deviation (SD) = 27**

- **UCL = Mean + (3×SD)**

- $1274 + (3 \times 27) = 1355$

- **LCL = Mean - (3×SD)**



$$\circ 1274 - (3 \times 27) = 1193$$

Quality Cost Relationship

Measuring Product Yield and Productivity

Yield in skincare manufacturing typically ranges from 90% to 95%.

We'll take a typical case: 93% good units, and assume:

- Total Input (I) = 100,000 units
- %G = 93% (midpoint within the industry-reported 90–95% yield range)
- %R (rework success rate) = 9%
 - $\text{Yield} = (I \times G) + (I \times (1 - G) \times R)$
 - **Calculation:**

$$\blacksquare (100,000 \times 0.93) + 100,000 \times (1 - 0.93) \times 0.09 = 93,000 + 63 = 93,630 \text{ units}$$
 - $\text{Yield \%} = \left(\frac{93,630}{100,000} \right) \times 100 = 93.63\%$

Quality Management on Productivity

- Productivity = Total Output / Labor Hours
- Total output = 93,630
- Labor Hours
 - 5 days/week $\times$ 8 hours/day = 40 hours / week
 - Over 4 weeks: $40 \times 4 = 160$ hours per worker
 - 100 workers $\times$ 160 hours = 16,000
- Productivity = $93,630 : 16,000 = 5.85 \text{ units / hour}$

Computing Product Cost per Unit

$$\text{Product Cost} = \frac{(K_d)(I) + (K_r)(R)}{Y}$$

- Labor cost = **Rp 25,000/hour** (Average hourly wage of workers in Banten)
- **Total Labor Cost**
 - 16,000 hours × Rp20,000 = Rp320,000,000
- **Product Cost per Unit (in Rupiah)**
 - Reworked units = 630
 - **Rework takes twice the time, so:**
 - Rework hours = $\frac{(630)}{5.85} = 215.4 \text{ hours}$
 - Rework labor cost = 215.4 × 25,000 = **Rp 5,385,000**
 - Regular Labor Cost: Rp400,000,000 – Rp5,385,000 = Rp394,615,000
- **Total Output (Y) = 93,630 units**

$$\text{Product Cost per Unit} = \frac{(400,000,000)}{93,630} = \underline{\underline{\text{Rp4,271.98}}}$$

Quality-Productivity Ratio

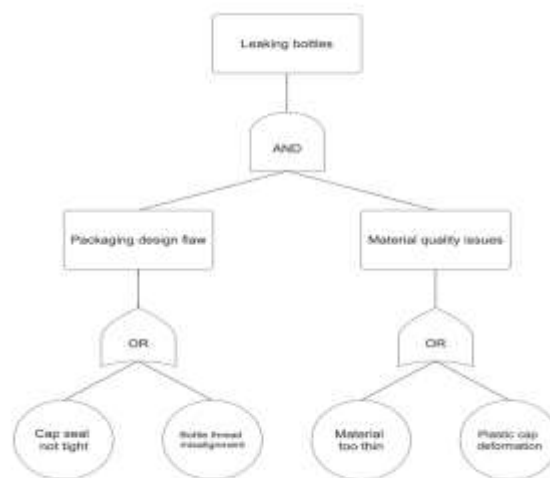
$$\text{OPR} = \frac{(\text{good-quality units})}{(\text{input})(\text{processing cost}) + (\text{reworked units})(\text{rework cost})} (100)$$

- Cost per input unit = $\frac{(394,615,000)}{100,000} = \text{Rp3,946.15}$
- Rework cost per unit = $\frac{(5,385,000)}{630} = \text{Rp8,547.62}$
- Quality Productivity Ratio = $\frac{(93,000)}{(100,000 \times 3,946.15) + (630 \times 8,547.62)} \times 100 =$
 $= \frac{(93,000)}{(394,615,000 + 5,385,000)} \times 100$
 $= \frac{(93,000)}{(400,000,000)} \times 100 = \mathbf{23.25\%}$

Product Design Data Analysis

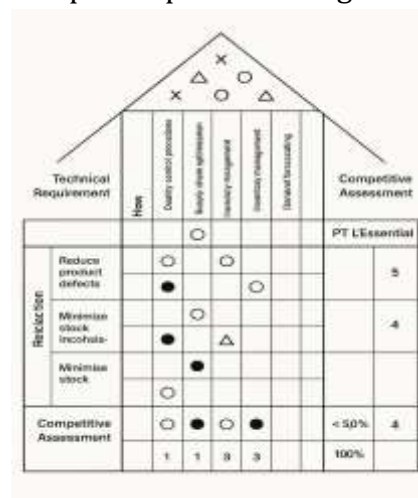
Fault Tree Analysis

Fault Tree Analysis (FTA) is a graphical technique used to examine how different failures are connected. It organizes possible failures and their underlying causes in a tree-like structure. The diagram uses two distinct symbols: one shaped like a hat with a straight bottom line to represent an "AND" condition, and another with a curved bottom line to indicate an "OR" condition.



Quality Function Deployment

Quality Function Deployment (QFD) employs a set of matrix diagrams that look like a series of interconnected houses. The initial matrix, known as the House of Quality, translates customer needs into specific product design features.



DISCUSSION

Integration of Data Analysis with Quality Management Theory

The integration of the data analysis results reveals important insights into PT L'Essential operational strengths and areas for improvement. Based on the Pareto analysis, it was found that leaking bottles and pump malfunctions contribute to 70% of the total defects, confirming the validity of the Pareto Principle (80/20 Rule) in quality management, where a few causes are responsible for the majority of problems. This suggests that PT L'Essential should prioritize solving these two main defect types to achieve significant improvements in product quality and customer satisfaction. Furthermore, the Statistical Process Control (SPC) data show that the company's production process is relatively stable, with the defect counts mostly within the control limits (UCL 1355 and LCL 1193). This stability aligns with the Plan-Do-Study-Act (PDSA) cycle theory, emphasizing the need for continuous monitoring and gradual improvements to reduce variations and approach a zero-defect production goal.

In terms of production efficiency, the company achieves a yield rate of 93.63%, which is within the industry's standard range of 90–95%. This good performance demonstrates that PT L'Essential is effectively managing its resources, consistent with Total Quality Management (TQM) principles that highlight the importance of maximizing efficiency without compromising quality. Productivity was calculated at 5.85 units per hour per worker, showing a reasonably efficient workforce performance. In connection to the Quality Management System (QMS), the consistent monitoring of yield, productivity, and defect rates reflects the company's efforts to meet customer and regulatory requirements, as QMS theory recommends. Moreover, considering the "Cost of Quality" concept, PT L'Essential could further minimize internal and external failure costs by strengthening preventive actions and focusing more on early-stage quality assurance.

The principles of Kaizen and continuous improvement are also highly applicable to the situation at PT L'Essential. The relatively stable yet improvable production environment suggests that small, continuous enhancements especially targeting the leading causes of defects would be an effective strategy to gradually elevate overall product quality and operational excellence. Therefore, the data-driven analysis fully supports the theoretical framework of Quality Management, emphasizing that consistent focus on critical defects, controlled production processes, efficient resource management, and continuous improvement initiatives are essential steps for PT L'Essential to achieve greater customer satisfaction and long-term success.

In calculating the product cost per unit at PT L'essential, an approach is used that takes into account both the direct manufacturing costs and additional costs resulting from

defective products that require rework. In Quality Management theory, the results obtained through the product cost per unit calculation provide important insights into the need to implement an effective management system. ISO 9001 emphasizes a process-based approach and the principle of continual improvement, both aimed at reducing product nonconformities that can affect customer perception and at improving operational efficiency. In the case of L'essential, the high percentage of defective products (7%) and the associated rework costs indicate that the existing control system needs to be strengthened, particularly in the stages of raw material inspection, product formulation, and production processes.

The principle of customer focus, which is at the core of ISO 9001, also becomes critically important. Since skincare products are directly related to consumer health, product quality must be prioritized to maintain customer trust and loyalty. ISO 9001 further requires organizations to implement risk-based thinking to analyze potential product nonconformities, such as defects that could impact costs and brand reputation. Therefore, L'essential needs to enforce stricter quality control measures, beginning with the selection of raw material suppliers, the consistent implementation of standard operating procedures (SOPs), and systematic final product inspections.

In addition, under ISO 9001, employee engagement and competence are key factors in maintaining quality standards. L'essential must ensure that all production staff receive adequate training and fully understand the importance of maintaining quality standards. This effort can help reduce the defect rate and improve production yield, thereby lowering total costs and increasing profitability. By consistently implementing an ISO 9001-based quality management system, L'essential can not only reduce rework costs but also enhance customer satisfaction, strengthen its premium brand image, and expand its competitiveness in the increasingly competitive skincare market.

The Quality-Productivity Ratio (QPR) approach serves as an essential tool for evaluating the effectiveness of resource utilization in producing high-quality products. According to Heizer et al. (2020), a low QPR is a strong indicator of inefficiencies within production processes, often resulting from inadequate employee training and non-standardized operational procedures. This situation is evident at PT L'Essential, where training gaps and deviations from standard processes have contributed to a suboptimal production performance. Organizations that successfully implement robust quality management systems can achieve significantly higher QPRs, reflecting lower defect rates, minimal rework costs, and more efficient resource usage (Evans & Lindsay, 2017).

The current low QPR at PT L'Essential highlights the need for systemic improvements in key areas such as raw material quality control, product formulation optimization, stricter

supervision of production activities, and enhanced inspection procedures at every stage of manufacturing. Based on the Cost of Quality (COQ) framework (Juran & Godfrey, 1999), the high expenditures associated with defective products and rework are categorized as costs of non-conformance, representing the financial impact of failing to meet quality standards. To enhance QPR, PT L'Essential should prioritize investments in the cost of prevention, including comprehensive employee training, supplier certification, upgrading production technologies, and reinforcing risk-based Standard Operating Procedures (SOPs) in accordance with the requirements of ISO 9001:2015 (ISO, 2015)

Integration of Data Analysis with Product Design Theory

The analysis of PT L'Essential defective products and stock mismatches shows a direct connection between product design inefficiencies and customer dissatisfaction. Two design analysis tools, Fault Tree Analysis (FTA) and Quality Function Deployment (QFD), offer structured ways to trace these problems back to their sources and identify how design flaws impact quality outcomes.

From the FTA, the root causes of frequent leaking bottles, broken seals, and pump malfunctions point to weaknesses in packaging material selection and structural design. These packaging failures contribute not only to unusable inventory but also to stock data inconsistencies between physical storage and digital systems. When defective units are stored or discarded without accurate tracking, stock levels in the system become unreliable, which disrupts distribution planning and order fulfillment.

On the other hand, the QFD (House of Quality) matrix reveals a gap between customer expectations such as durability, cleanliness, product information accuracy, ease of use, and the current packaging design features. For example, 15% of defect complaints stem from missing ingredient lists and incorrect labeling, which indicates a misalignment between product design and consumer information needs. This highlights that packaging must not only protect the product but also effectively communicate essential information to customers.

According to Zhang et al. (2024), data-driven product design can resolve these gaps by translating customer feedback into technical requirements early in the design process. PT L'Essential can utilize FTA to prevent design-induced failures, while QFD ensures customer demands are prioritized during redesign. By integrating these tools with internal defect data and customer complaints, PT L'Essential can proactively redesign packaging and labeling components to significantly reduce defects and improve customer satisfaction.

Strategic Implications, Solutions and Recommendations

Strategic Implications

The high percentage of defects, particularly in leaking bottles (40%) and pump malfunctions (30%), indicates serious design and quality control vulnerabilities in PT L'Essential packaging systems. These defects not only increase product returns and waste but also negatively impact brand credibility. Moreover, poor tracking of defective units contributes to stock inaccuracies, leading to overproduction, delayed deliveries, and customer dissatisfaction.

Solutions for PT L'Essential

1. **Redesign Packaging with Reliability Metrics:** Integrate metrics such as *Mean Time Between Failures (MTBF)* and *System Availability* into packaging component evaluation. This ensures pumps and bottles meet functional requirements over the product's lifecycle.
2. **Improve Labeling and Information Placement:** Implement standardized automated label verification systems using barcode scanners and machine vision to prevent incorrect or missing ingredients lists.
3. **FTA-Based Quality Control Checks:** Use Fault Tree Analysis diagrams to systematically monitor critical points in the production line where design-related failures originate, allowing for early-stage intervention.
4. **QFD for Customer-Centered Redesign:** Employ Quality Function Deployment to transform VOC (Voice of Customer) data into engineering and design *specifications*, particularly for packaging aesthetics, usability, and readability of labels.
5. **Smart Inventory Integration:** Develop or integrate a warehouse management system that flags defective products at the point of detection and automatically adjusts stock levels, ensuring accurate inventory reporting.

Recommendations

1. **Invest in Concurrent Engineering Teams:** Encourage collaboration between R&D, production, and warehouse teams during the design phase to ensure manufacturability and logistics considerations are embedded into the packaging design.
2. **Digital Feedback Collection System:** Install QR code-based feedback on product packaging to gather real-time customer insights and link them directly to design and quality assurance teams.
3. **Continuous Training in Design and Inspection:** Train line workers and quality inspectors on updated packaging standards, defect recognition, and the use of design evaluation tools such as QFD matrices.

By aligning product design improvements with both quality management data and customer feedback, PT L'Essential can reduce production inefficiencies, restore inventory accuracy, and enhance overall customer satisfaction—ultimately strengthening their competitive advantage in the skincare market.

CONCLUSION AND RECOMMENDATIONS

This study has successfully analyzed the quality management and product design problems experienced by PT L'Essential, with a particular focus on product defects and stock inconsistencies that impact customer satisfaction. The research found that the primary causes of product defects—especially leaking bottles and pump malfunctions—stem from weaknesses in packaging material selection, sealing quality, labeling accuracy, and production process control.

Through the application of quality management tools such as process flow charts, cause-and-effect diagrams, Pareto analysis, scatter diagrams, and control charts, it was identified that approximately 70% of defects originate from leaking bottles and pump issues. Product design analysis using Fault Tree Analysis (FTA) further traced these defects to technical failures in material durability and packaging system reliability. Meanwhile, Quality Function Deployment (QFD) revealed a significant gap between customer expectations (e.g., product safety, durability, clear information) and the technical specifications of current packaging designs.

Operational performance analysis showed that PT L'Essential production yield rate was 93.63% with a productivity rate of 5.85 units per labor hour, while the Quality-Productivity Ratio (OPR) was calculated at 37.74%. These figures indicate that while general production efficiency is within industry standards, the cost and impact of defects remain significant.

Managerial implications suggest that PT L'Essential needs to prioritize the improvement of packaging design, reinforce quality control at critical points of production, implement continuous employee training, and optimize inventory management systems to detect and track defective products more accurately. These strategic actions are expected to enhance overall product quality, improve operational efficiency, strengthen customer loyalty, and support PT L'Essential vision of delivering high-quality, innovative, and sustainable skincare solutions.

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