Business Review and Case Studies, Vol. 3 No. 3, December 2022
Permalink/DOI: http://dx.doi.org/10.17358/brcs.3.3.193
Available online at http://journal.ipb.ac.id/index.php/brcs

EISSN: 2721-6926

NEW PRODUCT DEVELOPMENT STRATEGY FOR SUSTAINABLE RIGID PLASTIC PACKAGING AT XYZ COMPANY IN 2022-2025

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Abstract: This study developed environmentally friendly products for XYZ Company through business strategy analysis, macro external environment analysis, industry analysis, the voice of customer analysis, functional analysis, canoe model integration and quality functional deployment, and cost-benefit analysis. Based on the analysis results, a new product development strategy for sustainable rigid plastic packaging was formulated at XYZ Company in 2022-2025. The formulation of a new product development strategy at XYZ Company began by collecting data from XYZ Company's Business Strategy, analyzing internal factors using functional analysis, and analyzing the external environment (regulations, economic, social, political conditions, industry pressures, and results of customer interviews with XYZ Company) with using PESTEL Analysis, Industry Analysis (Five Forces Porter), and Voice of Customer Analysis. All data were combined in the Kano model matrix and Quality Function Deployment Matrix, which produced new product characteristics that will become the basis for XYZ Company in designing new products, conducting cost and benefit analysis, and determining strategy formulation. Based on the analysis results, XYZ Company could develop a 20L Jerrycan product for refillable packaging with Post-Consumer Resin (PCR) Material, using Extrusion Blow Molding and Injection Molding Process, and collaborating with customers to develop product cycles for refillable packaging offered to customers. The XYZ Company's effective New Product Development Strategy for sustainable plastic packaging in 2022-2025 is manufacturing refillable packaging with PCR material and using existing machines.

Keywords: product development, kano model, quality functional deployment, sustainability, rigid plastic packaging

Abstrak: *Untuk menentukan pengembangan produk ramah lingkungan yang dapat dikembangkan oleh XYZ Company, dilakukan analisis strategi bisnis, analisis lingkungan eksternal makro, analisis industri, analisis voice of customer, analisis fungsional, integrasi kano model dan quality functional deployment, dan analisis biaya manfaat. Kemudian berdasarkan hasil analisis itu diformulasikan menjadi strategi pengembangan produk baru sustainable rigid plastic packaging di XYZ Company tahun 2022-2025. Formulasi strategi pengembangan produk baru di XYZ Company dimulai dari mengumpulkan data dari Strategi Bisnis XYZ Company, analisis faktor internal menggunakan analisis fungsional, dan analisis lingkungan eksternal (regulasi, kondisi ekonomi, sosial, politik, tekanan industri, dan hasil wawancara pelanggan XYZ Company) dengan menggunakan Analisis PESTEL, Analisis Industri (Five Forces Porter), dan Analisis Voice of Customer. Semua data dikombinasikan bersama dalam Matriks Kano model dan Matriks Quality Functional Deployment. Semua ini akan menghasilkan sifat-sifat produk baru yang menjadi dasar XYZ Company dalam pembuatan desain produk baru, melakukan analisis biaya dan manfaat, serta menentukan formulasi strategi. Berdasarkan hasil analisis yang dilakukan dalam tulisan ini XYZ Company bisa mengajukan pengembangan produk Jerrycan 20L untuk refillable packaging dengan Material Post-Consumer Resin (PCR), menggunakan Extrusion Blow Molding dan Injection Molding Process, berkolaborasi dengan pelanggan untuk mengembangkan product cycle untuk refillable packaging untuk ditawarkan kepada customers. Strategi pengembangan produk baru yang efektif untuk kemasan plastik jangka panjang (effective New Product Development Strategy for sustainable plastic packaging) XYZ Company di tahun 2022-2025 adalah pembuatan refillable packaging dengan material PCR dan menggunakan mesin yang sudah ada.*

Kata kunci: *Pengembangan produk, kano model, quality functional deployment, sustainability, rigid plastic packaging*

Article history:

Received
19 July 2022

Revised
16 November 2022

Accepted
5 Desember 2022

Available online
31 December 2022

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INTRODUCTION

More and more people are starting to care about environmental issues, especially plastic waste. The subjects of discussion are the amount of plastic waste that has accumulated, and the time it takes for plastic to decompose. Therefore, several companies, especially FMCG (Fast Moving Consumer Goods), have started their commitment to solving the plastic waste problem. Unilever (one of the FMCG companies in Indonesia) has a global target of reducing 50% of new plastic and using recycled plastic, ensuring 100% of plastic packaging can be reused or recycled or turned into compost, and collecting more plastic to be reprocessed it (Unilever, 2021).

Alexandra Palt. Executive Vice President of Loreal, explained that her company would make the product lighter or less material. It will reduce the environmental impact during production (Riani, 2020). In addition, there is a statement on the official website page "loreal.com" that in 2030 Loreal has a target to reduce the amount of packaging used by 20%. Loreal has a strategy to optimize its packaging by using recycled plastic as raw material, reducing packaging weight and volume, using natural materials from renewable energy sources, creating packaging that can be reused at home or in various places, and eliminating packaging quantity (Loreal, 2020). Several company movements have shown their commitment to reducing the amount of plastic and optimizing their packaging. This situation will threaten the plastic packaging industry, especially rigid plastic packaging.

The data from smithers.com, reported that Asia has the largest consumers who use plastic packaging with a percentage share of Global Consumption of 34% in 2020, followed by North America at 21.3% and Western Europe at 19% (Smithers, 2021). Based on the application, the market for plastic packaging is 40% used for food, 32% for non-food, and 28% for beverage products. In addition, 59.6% of the plastic processing is dominated by the blow molding process, 17.6% injection molding process, and 15.1% thermoforming process. Plastic packaging still exists in Asia's market. It gives opportunities for the plastic packaging industry. EXPO PACK Mexico 2020 Webinar claimed that the COVID-19 pandemic created demand and changes in the scenario for the plastic packaging industry (Robayo, 2020).

XYZ Company is one of Indonesia's leading rigid plastic and packaging companies with a strong market position. The vision of this company is "To be Asia's Leading Total Solutions Rigid Packaging and Plastic Provider". In addition, the company has developed four organizational cultures: customer-centric, operational excellence, innovative, and performance-driven. To fulfill this vision, XYZ Company has a division that focuses on product innovation and development. The name is XYZ Innovation Center, which focuses on providing the best rigid plastic packaging solutions for XYZ Company and its consumers. These innovation and product development steps are also in line with XYZ Company's sustainability goals. There are eliminating plastic packaging that uses mixed materials, using 25% Post-Consumer Resin material, and making products that are multi-functions and light weight.

Seeing the opportunities and threats from external factors currently increasing in the rigid plastic packaging industry, XYZ Company needs to evaluate the new product development strategy that is currently being implemented. This needs to be done by seeing the strategy of XYZ Company that is accommodating the current opportunities and threats of the rigid plastic packaging industry and its effectiveness in implementing new product development. It is still difficult for customer to accept new product development initiated by XYZ Company. This can be seen from the current condition that most new product developments are driven by consumer demand (customer/market pull). If XYZ Company only relies on a customer/market pull approach, the need for rigid plastic packaging will depend on the market needs. It will give the threat for the company's growth. If these conditions keep continuing, it can reduce the company's growth, which runs on rigid plastic packaging.

Currently, the percentage of new product development at XYZ Company is dominated by product development requested by customers. On the other hand, XYZ Company has implemented a technology-push approach to customers. To optimize this technology-push strategy, this paper will focus more on formulating new product development strategies with a technology push approach. So, customers can develop their products together with XYZ Company's proposal. A product development strategy with a Technology-Push approach has been carried out by a large company, Apple Inc (Reppel et al. 2006) in which the iPod product was developed differently than the existing music player.

Hence, the objectives of this study are: Receiving the implementation of Kano Model integration and Quality Function Deployment to determine the formulation of new product development strategies at XYZ Company. Creating a design for XYZ Company's new product development strategy for sustainable plastic packaging in 2022-2025.

METHODS

Research methodology is a systematic effort in problem-solving to answer the problems that occur. The research methodology provides an overview of the research, including procedures or steps taken, data sources and steps to obtain data, data processing methods and data analysis processes. The type of research in this paper is applied research that is applicable in creating new product development strategies at XYZ Company. Researchers use qualitative methods as the basis of research methods, such as interviews, observations, and analytical studies with various analytical methods and existing theories. Research activities were done by diagnosing current problems, collecting relevant data, and using theory and management analysis tools to obtain the expected new product development strategy design. This research was done from February to July 2022.

The supporting data is needed to support this research while formulating the new product development strategy for the company. The primary data was collected by interviews (internal and external) and observation data; the secondary data was collected by company performance data, regulations that apply in Indonesia and those in other countries, and data from news or articles on the Internet. Meanwhile, strategic formulation refers to the management analysis tool and the theoretical basis used.

After collecting all the primary and secondary data obtained from the internal and external company, the data were analyzed using tools and data processing methods in accordance with the stages of the strategy to obtain the results of the research identification process. This study used the methods of vision-mission analysis, external analysis (PESTEL and Industry Analysis), internal analysis (functional analysis), Kano Model analysis, Quality Functional Deployment Analysis, and Cost and Benefit Analysis. The analytical framework used in this research is shown in Figure 1. To formulate the XYZ Company's Product Development Strategy, this research started by collecting data from strategic business of XYZ Company, internal factor analysis, which used functional analysis method, and external factor analysis (such as the regulation, economic, social, political, industrial forces, and XYZ's Customer interview results) by using PESTEL Analysis, Five Forces Porter Analysis, and Voice of Customer Analysis. These data will be collected and combined into the Kano Model Matrix and Quality Functional Deployment Matrix. These will give all the properties or requirements of the new product. These requirements will be a background to the XYZ Company to make a product design, do the cost and benefit analysis, and formulate strategy.

RESULTS

XYZ Company's Business Strategy in 2022-2025

Based on the results of the 2022 Annual Strategy Review Meeting held on November 8-16, 2021, the business strategy has a big theme which is "Moving as One for Sustainability", which was put forward by the Chief Executive Officer of XYZ Company at the opening ceremony of 2022 ASRM. In this activity, XYZ Company has several main company targets, there is EBITDA (Earnings Before Interest, Taxes, Depreciation, and Amortization) minimum growth is 8%, executing the Sustainability Program and having a new mindset. To increase EBITDA growth by 8%, all factories need to increase margins and even more significant growth.

Several steps or milestones are needed to executing the Sustainability Program, with the target focused on the Reduce, Reuse, and Recycle (3R) strategy. Reduce is meant to optimize the weight of the product so that it can be produced with a minimum weight that is still following the quality demands requested by the customer and or provide solutions for reducing the weight of the customer's product. Reuse refers to in this strategy is to create alternative packaging that can be reused (refillable) and packaging that can be used for various purposes (multi-purpose packaging). Recycle in this strategy is to start implementing consumers recycled materials (post-consumer resin recycling) and replace materials that cannot be recycled. By 2025,

XYZ Company have to use recycled materials as 25% of all products produced. The next strategy is to apply a new mindset to become a winner through situational leadership and make the group win. Business Strategy targets are shown in the business strategy map shown in Figure 2.

PESTEL Analysis

This analysis is used to identify external factors that affect a company. PESTEL analysis can be used to consider opportunities and threats stemming from political and legal, economic, social, technological, and environmental factors (David, 2011). The following is PESTEL's analysis that affects XYZ Company's business in 2022-2025.

Based on PESTEL's external environmental analysis shown in the Table 1 below, it can be concluded that the plastic packaging industry has the opportunity to continue to grow with the technology that supports the development of new environmentally friendly plastic packaging. However, the plastic packaging industry also needs to initiate the development of new plastic packaging products by adjusting existing laws, policies, and social conditions in response to existing threats.

Five Forces Porter Analysis

This analysis identifies opportunities and threats from the attractiveness of the industry. There are five types of pressure categories analysed, namely suppliers, customers, substitute products, new entrants, and competitive (David, 2011). Table 2 below summarizes the detailed analysis of the pressures that affect the plastic packaging industry.

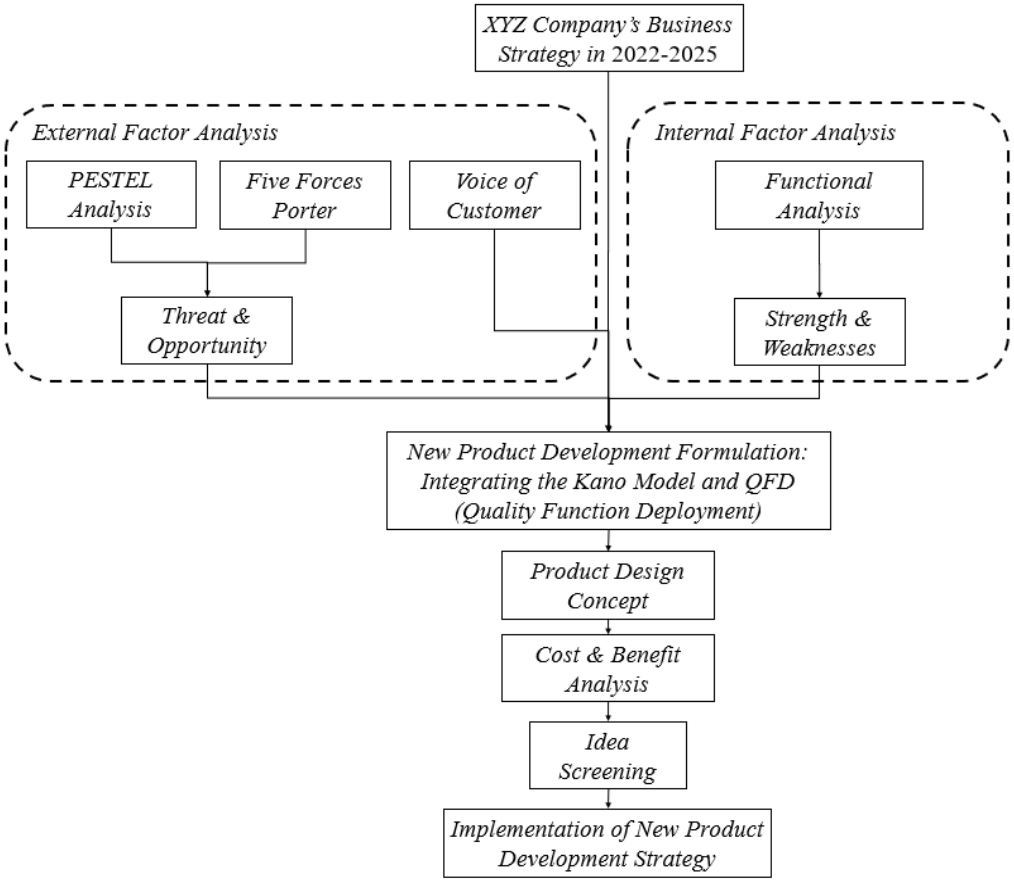

Figure 1. Analytical Framework

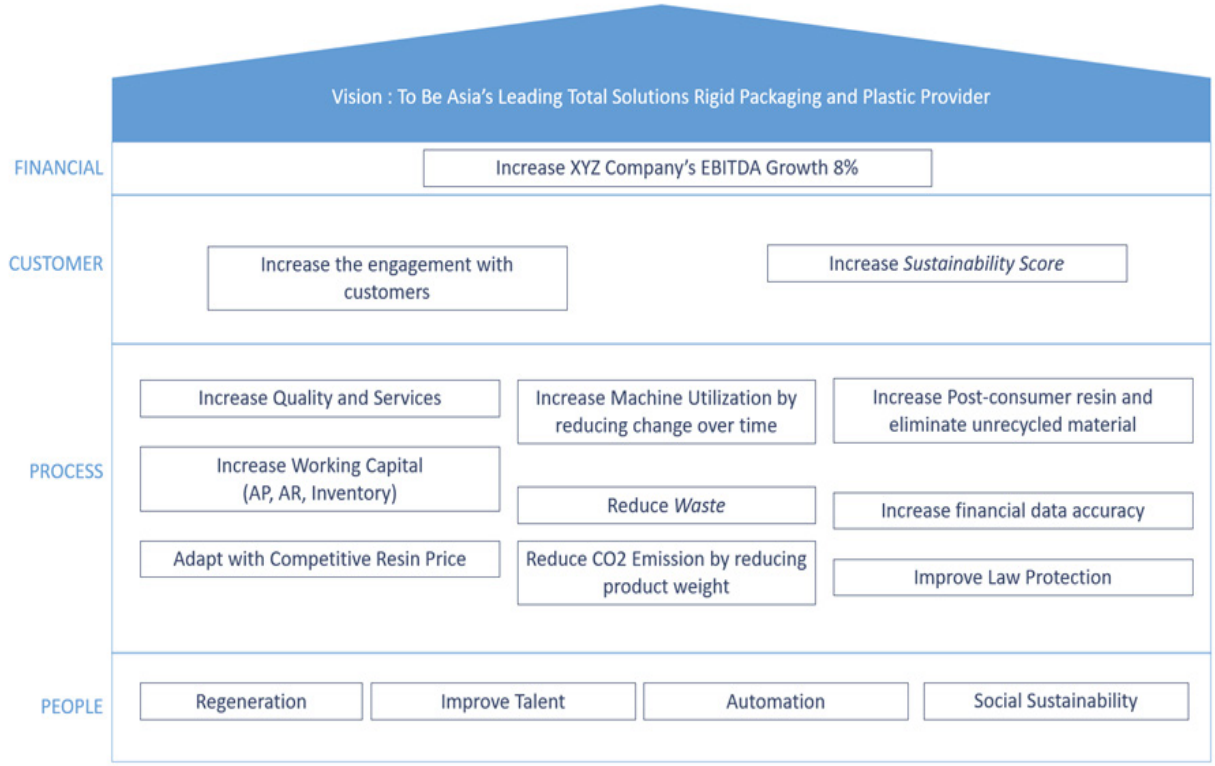

Figure 2. XYZ Company's Business Strategy Map in 2022-2025

Table 1. PESTEL Analysis in 2022-2025

Current Condition	Impact in the next 3 years	Opportunity/Threat
Politic and Legal		
Publishment of Paris Agreement to The United Nations Framework Convention on Climate Change (Geddie, 2022; Parliament, 2019)	Reduce the usage of plastic packaging for brand owner and plastic converter globally	Threat. Reducing Plastic packaging demand.
Publishment of Undang-undang nomor 16 tahun 2016 about Climate Change (Indonesia, 2016)	Reduce the usage of plastic packaging to reduce the climate change that will happen in Indonesia	Threat. Reducing Plastic packaging demand.
Kementrian Lingkungan Hidup dan Kehutanan (KLHK) gives the target about waste reduction up to 30% in 2025 and published the regulation of Peraturan Menteri LHK nomor P.75 tahun 2019 about waste producer road map reduction plan (Susanto, 2020)	Organize the plastic producer to reduce the wate start from design that can be recycled/reused/ composed.	Opportunity. Create the new green product that environmentally friendly.
Economy		
Indonesia's economic conditions are getting better. As shown in the first quarter of 2022 Indonesia's economic growth achievement is already above the average gross domestic product (GDP) in 2019 (Anonim Kemenkeu, 2022)	The turnover of goods and services will grow and increase the need for packaging for daily products, the majority of which use plastic packaging.	Opportunity. The Growth of plastic industry will keep increase.
There is a projected inflation in developed countries to rise from 3.9% to 5.7% and developing countries will soar from 5.9% to 8.7% due to an increase in demand that is not followed by supply availability due to the Covid-19 pandemic (Anonim Kemenkeu, 2022)	The demand for goods is increasing but availability is very limited which causes a bottle neck in the supply chain.	Threat. The inflation gives impact to the supply chain.

Table 1. PESTEL Analysis in 2022-2025 (Continue)

Current Condition	Impact in the next 3 years	Opportunity/Threat
Social		
There are some activities to invite and increase public awareness in the implementation of a circular economy (Pratiwi, 2021)	The development of community culture to use products not only to be used and then discarded, but to be reprocessed into resources or recycled products.	Opportunity. Plastic packaging industry will get support from society to supply the post-consumer resin supply chain.
Plastic waste recycling in Indonesia is low, less than 10% of plastic waste is recycled and more than 50% ends up in landfills (Syahni,2019)	It is difficult to find a supply of recycled plastic due to the difficulty of recycling plastic waste in Indonesia.	Threat. Plastic packaging industry will get shortage of post-consumer resin.
Technology		
There is a new packaging innovation for paper packaging for FMCG (Fast Moving Consumer Good) products (Nott, 2021)	Brand owners such as Coca-Cola, Unilever, and L'Oreal have started developing paper packaging products to support the circular economy.	Threat. There is a packaging change from plastic to paper.
Publishment of the EU Directive 2019/904 decision regarding Thetered Cap in Europe which gave rise to a new trend of new bottle caps to support the circular economy (Anonim, 2021).	There is a demand for product development, especially tethered caps with tamper evidence.	Opportunity. The growth of plastic packaging industry will keep increase to support circular economy.
Environment		
Indonesian people's awareness of plastic waste is still low (Maulana, 2019)	It has resulted in people's perceptions that they still need the use of plastic packaging.	Opportunity. The growth of plastic packaging industry will keep increase.
Indonesian people's awareness of plastic waste is still low (Maulana, 2019)	It is difficult to educate the Indonesian people to collect waste in a segregated manner so that plastics can be recycled properly.	Threat. Plastic packaging industry will get shortage of post-consumer resin

Based on the analysis of the Five Forces Porter shown in Table 2, it can be concluded that the plastic packaging industry has the opportunity to continue to grow, which is indicated by the low competitive pressure and the pressure of new entrants. On the other hand, the plastic packaging industry also needs to take the initiatives to develop new plastic packaging products to respond to high pressure from customers, suppliers, and the emergence of new packaging product substitutions.

Voice of Customers

To develop new product, management should focus with customers need (Griffin, 1996). In this paper, the author focuses on the customers or customers of three major customers of XYZ Company. They are Company A, B, and C. These three companies are the Fast-Moving Consumer Goods (FMCG) company, which uses rigid plastic packaging. XYZ Company is one of the suppliers of their plastic packaging. These three companies are also market leaders in the FMCG industry.

On the official website of the first XYZ's customers, Company A has a plastic packaging policy to support the circular economy. Global consumption of plastic used by company A was 140,000 tons of plastic in 2018. In recent years, Company A has committed to improving the environmental and social profile of all its products. Company A explicitly has five strategic steps to optimize the plastic packaging used. There are using recycled materials, reducing product weight and volume, using materials from renewable energy sources, making reusable or refillable packaging, and eliminating packaging through innovative formulas.

Globally, Company B recognizes that plastic is a safe and efficient material for products and consumers. This is reported in the official article on the Unilever website. Although plastic has a low carbon footprint compared to other materials, it ends up in the environment and must be stopped. Global research shows that if there is no action or action on reducing plastic, plastic will continue to increase and four times the excess plastic will be anchored in the environment and the sea by 2040. Company B realizes that the plastic produced is

their responsibility too, so Company B also needs to reduce the amount of virgin plastic packaging used.

In addition, Company C also has its view on plastic packaging. Based on articles published on Company C's official website, plastic packaging plays an important role in delivering products to consumers. Product protection, consumer safety, ease of use, and security of communications and information are critical when providing products to consumers. However, Company C is also trying to encourage the creation of a circular economy where the packaging used can be 100% recycled or reused. To achieve 100% recyclable or reusable packaging, Company C chose flexible packaging as the primary material because it allows a significant reduction in pure plastic but currently has limited recycling capabilities. Company C is working to increase the recyclability of this flexible packaging with types of packaging that can be recycled where possible and partnering with several groups. To reduce the use of pure plastic by 50% in packaging, Company C plans to continue to reduce packaging weight, increase the use of recycled materials, encourage consumer conversion to more efficient product forms and, if necessary, use alternatives to plastics.

Based on this analysis, generally customers of XYZ Company require plastic packaging that uses recycled material content as much as possible, packaging designs that are easy to collect and reprocess, reduce product weight and volume, reusable or refillable plastic packaging, and efforts to use new packaging other than plastic packaging.

Table 2. Five forces porter analysis

No	Forces	Condition	Forces category
I	Supplier's forces		
sub factor	Limited suppliers of recycled materials that can be used in the manufacturing industry	The reduced supply of recycled materials that can be used as raw materials for making plastic	High
Sub factor	The high price of recycled materials compared to the price of virgin materials.	The high price of recycled materials affects the selling price of plastic packaging.	High
Sub factor	Machine maker and mold maker started the initiative to develop machine/mold products.	It is easier to develop new products because of the support from machine and mold suppliers.	Low
II	Customer's forces		
sub factor	Publishment of customer targets to improve plastic packaging with recycled plastic packaging raw materials	The increasing demand for plastic packaging made from recycled plastic.	High
Sub factor	Publishment of policies and target customers to reduce product weight.	The growing demand for product development with reduced weight	Middle
Sub factor	Publishment of policies and target customers to promote refillable packaging.	The decrease in the demand for rigid plastic packaging because it is used for refillable packaging.	High
III	Product substitution forces		
sub factor	New packaging paper packaging development have been starting.	The development of new paper packaging used by several large companies.	Middle
Sub factor	There is customer policy on recycled packaging or refillable packaging (nott, 2021)	The increasing demand and need for flexible plastic packaging with light packaging weight	High
IV	New entry forces		
sub factor	The need for high investment and the reputation of plastic packaging companies are the determining factors in customer selection for the manufacture of plastic packaging.	It is difficult to enter the plastic packaging industry.	Low
Sub factor	The companies in the plastic packaging industry are high (indonesia internally and other country)	Increased competitiveness among plastic packaging industry companies.	Middle

Functional Analysis (Internal Factor Analysis)

This functional analysis (David, 2011) is used to identify the strengths and weaknesses of XYZ company. In this analysis, the results are based on documented studies and interviews with the top management of XYZ Company. Table 3 shows a summary of the functional analysis of XYZ Company. Based on the functional analysis results shown in the Table 3, it can be concluded that XYZ Company has a competitive advantage over the Innovation Center, which focuses on developing new products. In addition, XYZ Company has advantages in marketing by having good relationships with large customers, having human resources that continue to grow, and having complete plastic packaging production machines. On the other hand, XYZ Company has weaknesses in its financial policies that limit investment in technology or new machines and the limitations of production machines that only focus on plastic packaging production machines.

Table 3. Functional Analysis of XYZ Company

Functional Analysis of XYZ Company	
Marketing	XYZ Company serves customers throughout Asia, especially Southeast Asia and Indonesia to produce baby care packaging (Baby care packaging), Personal care packaging, home care packaging, cosmetic, food and beverage (food and beverage), lubricants (Lubricant), medicine pharmaceuticals, and components from the automotive industry.
	The marketing activity of XYZ Company is Business to business/B2B which focuses on customers (Customer Centric) with key account sales for each customer. In addition, XYZ Company has a New Business Development division that focuses on business development.
Finance	XYZ Company's financial condition in 2021 experienced an increase in revenue by 10% from 2020, an increase in EBITDA by 34%, and a decrease in NPAT by 23%. The decrease in NPAT was due to several investments and the acquisition of several factories in Singapore and Malaysia which had an impact on increasing debt (debt).
	To give a positive impact on financial performance, XYZ Company has several directions in 2022 to increase EBITDA by 8% by increasing product volume and reducing fixed costs, continuing to continuously improve the CCC (Cost Conversion Cycle) value, increasing liquidity, and optimizing & selecting for the cost of capital (capex expenditures) with the Capex Committee.
Human Resources	XYZ Company is committed to upholding human rights for every employee, with two principles. They are that businesses must support and respect the protection of human rights internationally and businesses must ensure that employees are not involved in human rights violations.
	To support this, XYZ Company is committed to providing equal opportunities and treatment at work, a safe work environment, social security coverage, providing a space for dialogue with trade unions, and anti-discrimination.
	In addition, XYZ Company also employs several migrant workers with a number below 5% to strengthen the workforce and provide more experience for employees.
Operation	XYZ Company has 15 factories operating in Indonesia, 2 factories in Thailand, 6 factories in Vietnam, 3 factories in Malaysia, and 3 factories in China.
	XYZ Company has several plastic packaging manufacturing technologies to support customer needs, namely Injection Molding, Extrusion Blow Molding, Injection Blow Molding, Injection Stretch Blow Molding, and Plastic Tube Extrusion Machine.
	The plastic materials used by XYZ Company in the production process are HDPE (High Density Polyethylene), LDPE (Low Density Polyethylene), PP (Polypropylene), PET (Polyethylene Terephthalate), and PS (Polystyrene).
Research and Development	XYZ Company has a center for innovation, technology, new product development, and the development of a new project called the Innovation Center located in Indonesia. The focus of Innovation Center is to provide the best plastic packaging solutions for XYZ Company and XYZ Company's customers.
	The Innovation Center focuses on product development to eliminate mixed materials in packaging, use 25% recycled materials, and reduce plastic packaging weight (light weighting).
	Some of the product developments that have been successfully carried out by the Innovation Center are anti-counterfeit solutions, bottle caps with special functions, new bottle and cap designs, creating alternative solutions for paper packaging and flexible packaging (pouch), as well as lightweighting & cost-effectiveness.
Information Technology	XYZ Company already uses the SAP system in every business process that is carried out which is integrated in the XYZ Company. In addition, XYZ Company has a special division that always monitors the development of XYZ's business, namely the Strategic Management Office which collects all information in the management system for the purposes of making top management decisions.

Kano Model dan Quality Functional Deployment Integration

To get the product properties that match between external factor, customer need, and internal capability is required the tools. The integration between Kano Model and Qulality Functional Deployment is the tools which is used in this paper. This tools/method has been used by Tontini (2007) in a Mug Design Figure 3 shows the classification of customer demand, which results in the basic requirement that there are no leaks and they have the same product function as the current packaging. Requirements that will improve performance (performance requirements) are products that can use recycled materials and eliminate colors used in packaging. Requirements that will improve performance but if the requirements are not met will not have an impact on customers (excitement requirements), namely reducing product weight, changing materials from HDPE to PET, and packaging that can be recycled.

Figure 4 shows the QFD Matrix that combines the voice of the customer, Kano Model, technical requirements, weight calculations, and the order of requirements that can be accommodated by the strengths and weaknesses of XYZ Company. Based on the results of this QFD Matrix, it is found that the priority of product properties is as follows:

1. Using existing machines for the process of making plastic packaging such as Injection Molding, Extrusion Molding, Injection Blow Molding, and Injection Stretch Blow Molding.
2. Reducing the weight of products on the market with a lower weight to reduce the amount of plastic material used
3. Designing a refillable packaging.
4. Maintain good relationships with big companies in product development
5. Implementing recycled materials or post-consumer resin on product packaging that is now being produced.
6. Using existing facilities at XYZ Company
7. Creating new specifications for new product development
8. Using a shrink sleeve as a product identity and eliminating bottle color for easy recycling.
9. No investment for new process machines.

Product Design Concept

Based on the priority list of product properties obtained from the integration of the Kano Model and Quality Functional Deployment, the author makes three options for product design concepts for plastic packaging according to the obtained product properties. Table 4 below shows three product design concept options and product illustrations, namely, Jerrycan 20L for Refillable Packaging with PCR Material, using Extrusion Blow Molding and Injection Molding Process, collaborating with customers to develop product cycles for refillable packaging, bottle packaging and bottle caps. without color and using a shrink sleeve as the color of product identity using Extrusion Blow Molding and Injection Molding Process, collaborating with customers to develop products that are easy to recycle, using PCR materials, and PET bottle packaging (lightweight) and short neck closure with a lighter weight, using Injection Stretch Blow Molding and Injection Molding Process.

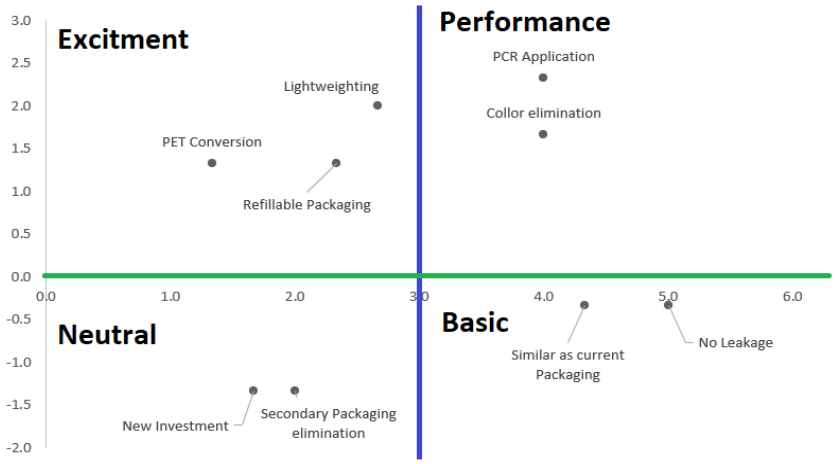

Figure 3. Kano Model Classification for plastic rigid packaging

VoC vs Technical requirment • 6 (Strong) o 3 (Fair) ◊ 1 (week)		Priority/weight	Kano Model Classification	% Weight Reduction Ability	Quality Specification Making	New Refillable packaging Design	Shrink Sleeve Machine for Color Elimination	Machine Readiness for PCR Implementation	Use Existing machine availability	Use Existing Facilities	Good relationship with Big Company	New Machine Investment Technology
				Technical Requirement								
Voice of Customers	No Leakage	21%	B	6	6	6	1	6	6	3	3	1
	Similar as current packaging	19%	B	6	6	6	1	6	6	3	3	1
	New investmnet product	2%	N	3	1	1	1	1	1	1	6	6
	PCR Application	17%	P	3	3	6	3	6	6	6	6	1
	Refillable Packaging	12%	E	6	3	6	3	3	6	6	6	1
	Color Elimination	14%	P	6	3	6	6	3	6	6	6	1
	Lightweigthing	10%	E	6	3	1	1	3	6	3	6	1
	PET Conversion	2%	E	6	3	1	1	1	3	3	6	3
	Secondary Packaging elimintation	2%	N	1	3	6	1	3	6	6	6	1
		100%										
Absoulte Value				5.3	4.2	5.3	2.3	4.6	5.8	4.3	4.8	1.2
Realtive (Rank)				2	7	3	8	5	1	6	4	9
Objective				Packaging which is lighter than current packaging	New Specification Development	Packaging that can refillable	Use Shrink Sleeve to replace color identity	Implement PCR immidiately	Use EBM, IBM, IM, ISBM Process	Use Existing material, utility, and procedure	Close Communication with Customer	No Investment

Figure 4. QFD Matrix for new plastic packaging development

Tabel 4. Product Design Concept

Option	Product Idea	Product Ilustration	Points Requirement that match
1	Jerrycan 20L for Refillable Packaging with PCR material, use Extrusion Blow Molding dan Injection Molding Process, collaborating with customer to develop new product cycle for refillable packaging.		1,3,4,5,6,7,9
2	Bottle and Cap Packaging without color (natural color) and use shrink sleeve for the color identitiy. Use Extrusion Blow Molding dan Injection Molding Process.		1,4,5,6,7,8,9
3	Lightweighting PET Bottle Packaging and use short neck with a lighter weight that used Injection Stretch Blow Molding dan Injection Molding Process.		1,2,4,6,7,9

According to the cost and benefit analysis which is adapted (Alijoyo, 2021), the results can be concluded can be concluded that Option 1 has a value of 144%, Option 2 has a value of 69%, and Option 3 has a value of 140%. Recommendations that can be given from this analytical technique is that the results of the analysis must be above 100% and the highest value. Therefore, the product design concept option chosen from this analysis is Option 1, namely Jerrycan 20L for Refillable Packaging with PCR Material, using Extrusion Blow Molding and Injection Molding Process, collaborating with customers to develop a product cycle for refillable packaging.

XYZ Company's New Product Development Strategy Formulation

This product development strategy is a process of integrating technology and marketing. Figure 5 shows the Jerrycan 20L product development strategy that needs to be carried out by XYZ Company to respond to the circular economy issue that has an impact on plastic packaging (Nyström, 1985). The implementation of XYZ company's new sustainable rigid plastic packaging product development strategy for 2022-2025, focuses on the development of the Jerrycan Refillable 20L product above, is expected to be an effective total solution for customers to respond to circular economic issues and protect the environment. In addition, the development of this product will enhance the product development of XYZ Company as well so that it can respond to the existing challenges. Figure 6 shows a summary of the steps and milestones to be achieved during implementation.

Managerial Implications

This research gives several recommendations for managers, as follows:

1. Managers should evaluate the current new product development strategy currently run in the organization, especially how to make a technology-push product development to customer by making a Refillable packaging to its customers.
2. There is a need to know company's weaknesses (financial policies that limit investment in technology or new machines and the limitations of production machines that only focus on plastic packaging production machines) and strengths (XYZ Company has a competitive advantage over the Innovation Center, which focuses on developing new products) in facing opportunities and overcoming emerging threats, especially with the increasing public concern for the environment.

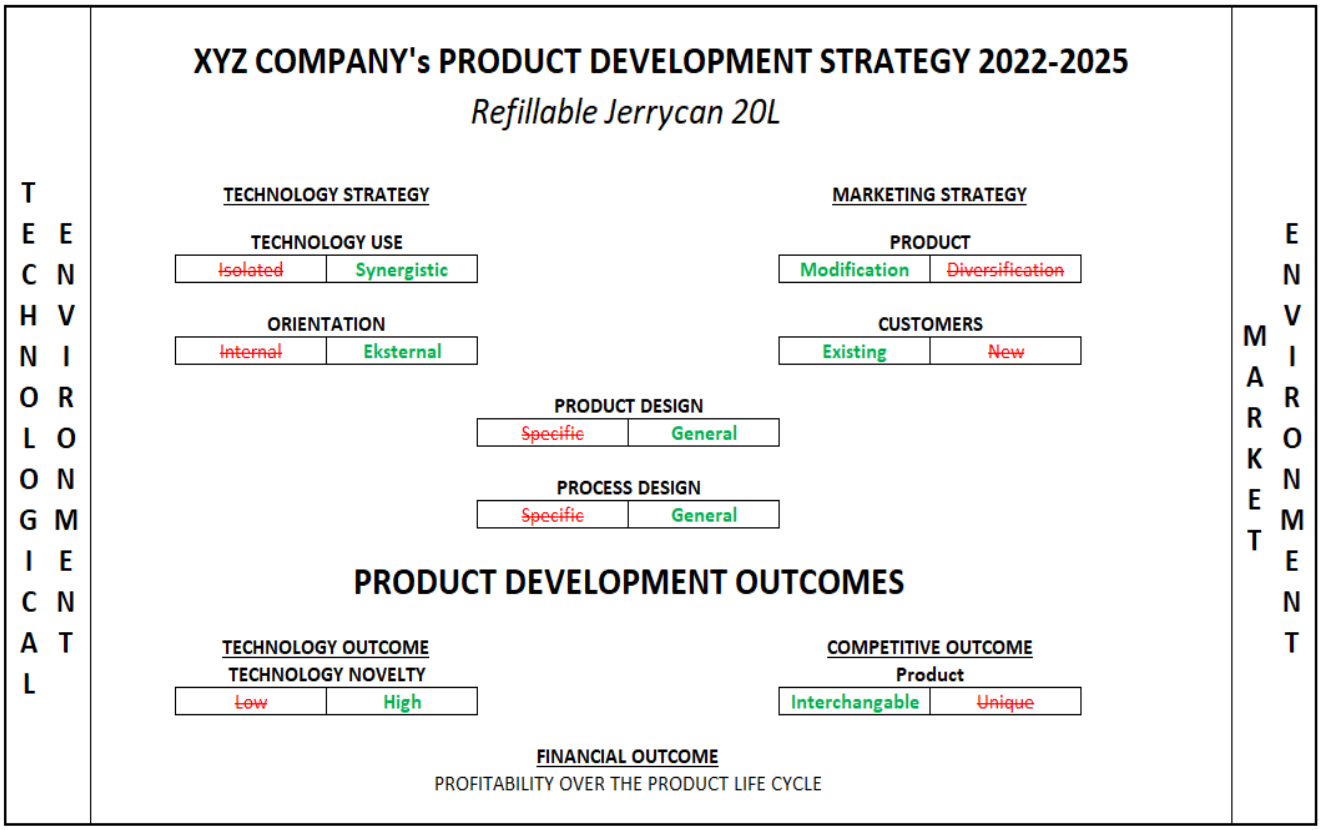

Figure 5. Product Development Strategy Jerrycan 20L XYZ Company 2022-2025

No	Program and Activity	PIC	Start	Finish	Milestone	Milestone dan Timeline													
						2022		2023				2024				2025			
						Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
A	**Prepareation and Concept Design Finalization**																		
1	Drawing Design development	NPD	Aug-22	Oct-22	Q4-2022 get the final design, prespecification, dan machine														
2	Pre-specification development	NPD	Oct-22	Nov-22															
3	Production Machine decision	NPD & Production	Nov-22	Dec-22															
B	**Present to Communication**																		
1	Presentation Preparation	NPD & Sales	Jan-23	Feb-23	Q2-2023 get the customers approval to continue the product development														
2	Present to some customers (Innovation Workshop dan Knowledge Sharing)	Sales	Feb-23	Mar-23															
3	Follow up Customers	Sales	Mar-23	Apr-23															
4	Customers approval	Sales	Apr-23	May-23															
C	**Product Development Process**																		
1	Pilot Development	NPD & Sales	May-23	Aug-23	1 Year Product development and Q2-2024 the product is ready for mass production														
2	Transport Test	Production & PPIC	Aug-23	Sep-23															
3	Product Cycle Test	NPD	Sep-23	Nov-23															
4	Apply patent design	NPD	May-23	May-24															
5	Commercial Development	NPD & Sales	Nov-23	May-24															
6	Mass Production	Production	May-24	Jun-24															
D	**Evaluation dan Improvement**																		
1	Product Quality Evaluation	NPD & Quality	Jun-24	Sep-24	1 year evaluation and improvement new product development														
2	Delivery and Distribution Evaluation	NPD, Quality, PPIC	Jun-24	Sep-24															
3	Quality Improvement	Production & Quality	Sep-24	Dec-24															
4	Continous Improvement	Quality	Dec-24	Mar-25															
E	**Financial Outcomes calculation**																		
1	Profitability Evaluation	Finance & Sales	Mar-25	Sep-25	Q3-2025 get financial evaluation														
2	Product Life Cycle Evaluation	Finance & Sales	Mar-25	Sep-25															

Figure 6. Step Summary and milestone for implementing XYZ Company's Product Development Strategy

3. Managers should also create a strategic direction that shown in Figure 5 and plan or steps for new product development that shown in picture 6 which has same direction with the company's vision and mission in manufacturing rigid plastic packaging with a new product development process that is more scalable and can be applied in the company's business.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The Implementation plan for Kano Model integration and Quality Function Deployment at XYZ Company provides three product development options, there are Jerrycan 20L for Refillable Packaging with PCR Materials, using Extrusion Blow Molding and Injection Molding Process, collaborating with customers to develop product cycles for refillable packaging, packaging bottles and bottle caps without color and using shrink sleeves as product identity colors using Extrusion Blow Molding and Injection Molding Process, collaborating with customers to develop products that are easy to recycle, using PCR materials, and PET bottle packaging (lightweight) and short bottle caps (short neck) with a lighter weight, using Injection Stretch Blow Molding and Injection Molding Process. This choice is an option in determining the formulation of a new product development strategy that can be carried out in 2022-2025. This integration method between Kano model and Quality Function Deployment can be used and workable for this study which similar that Tontini did in the previous study. XYZ Company's new product development strategy for sustainable plastic packaging in 2022-2025 is manufacturing of refillable packaging with PCR materials and using existing machines.

Recommendations

The scope of this research is limited to the analysis of the internal environment, the external environment, and the creation of new product development strategies. To measure the effectiveness of the strategy formulation steps, it is necessary to evaluate the performance of product development from the actual results in the future.

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