ASSESSMENT ON RISK-BASED MARKETING OF BIO-OSD PRODUCT FOR HANDLING OIL SPILLS AT THE WATER SURFACE

KAJIAN PEMASARAN BERBASIS RISIKO PRODUK BIO-OSD UNTUK PENANGANAN TUMPAHAN MINYAK DI PERAIRAN

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ABSTRAK

Tumpahan minyak bumi yang terjadi pada saat eksplorasi dan transportasi dapat mencemari lingkungan, baik tanah maupun perairan. Oil Spill Dispersants (OSD) diperlukan untuk mendispersikan tumpahan minyak bumi, sehingga memudahkan proses penanganan selanjutnya. Bio-OSD merupakan produk ramah lingkungan karena diproduksi menggunakan surfaktan turunan dari minyak sawit. Penelitian ini bertujuan untuk mendapatkan informasi tentang strategi pemasaran produk Bio-OSD dengan memperhatikan potensi pasar dan risiko pemasarannya sebagai salah satu tahapan penting dalam proses komersialisasi. Penelitian dilakukan dengan menganalisis kebutuhan dan ketersediaan, bentuk pasar, keadaan pesaing produk Bio-OSD, dan merancang strategi pemasaran berbasis risiko melalui bauran antara Segmenting, Targeting, Positioning (STP) dengan Product, Price, Place, Promotion (4P), serta analisis risiko menggunakan metode House of Risk (HOR). Sebagai pembanding, digunakan produk OSD komersial. Hasil penelitian menunjukkan bahwa produk Bio-OSD memberikan nilai positif dan unggul terhadap parameter kualitas dan harga dibandingkan produk OSD komersial, sehingga layak untuk dikomersialisasikan. Rancangan strategi pemasaran B2B menghasilkan segmentasi dan target pasar tertuju pada anak perusahaan PT Pertamina (Persero), serta posisi produk sebagai produk diversifikasi. Rancangan bauran pemasaran menghasilkan produk memenuhi kebutuhan dan sesuai standar, kisaran harga sebesar Rp.50.000-Rp.80.000/L, pada sasaran penjualan di Pulau Jawa, dengan promosi dilakukan secara luring dan daring. Rancangan manajemen risiko pemasaran menghasilkan tiga prioritas aksi mitigasi risiko yaitu monitoring dan analisis data pemasaran secara teratur, pelatihan dan pengembangan kemampuan karyawan, dan memperluas media promosi.

Kata kunci: OSD, surfaktan, minyak sawit, risiko, pemasaran

ABSTRACT

Oil spills during exploration and transportation can pollute the land and water environment. Oil Spill Dispersants (OSD) are needed to disperse petroleum spills, thus facilitating the subsequent handling process. Bio-OSD is an environmentally friendly product because it uses surfactants derived from palm oil. This study aims to obtain information about the marketing strategy for Bio-OSD products by considering market potential and marketing risks as one of the important stages in the commercialization process. The research was carried out by analyzing the needs and availability, form of the market, and conditions of competitors for the Bio-OSD product and designing a risk-based marketing strategy through a mix between Segmenting, Targeting, Positioning (STP), and Product, Price, Place, Promotion (4P), as well as risk analysis. They were using the House of Risk (HOR) method. As a comparison, commercial OSD products were used. The results showed that the Bio-OSD product gave positive and superior values in terms of quality and price parameters compared to commercial OSD products, so it was feasible to be commercialized. The B2B marketing strategy design results in segmentation and target markets aimed at PT Pertamina (Persero) subsidiaries, as well as product positioning as a diversified product. The marketing mix design resulted in products that meet the needs standards, with a price range of IDR 50,000-IDR 80,000/L, target sales in Java, and promotions carried out both online and offline. The marketing risk management plan indicates three priority risk mitigation actions namely; regular monitoring and analyzing of marketing data, training and development for improving workers capability, and expanding promotional media.

Keywords: OSD, surfactant, palm oil, risk, marketing

INTRODUCTION

Oil pollution has become a serious issue in line with the development of Indonesia's oil and gas industry. According to data from the Badan Pusat Statistik Republik Indonesia (2021), crude oil production reaches 17,742,360 barrels per day, and the waste generated accounts for about 37% of the

production figure, which can contaminate the environment. One of the environmental pollution incidents is oil spills. Oil spills can occur during exploration, production, and transportation activities in water areas. Other causes include operations of tanker ships (water ballast), docking (ship repairs and maintenance, mid-sea loading/unloading terminals, ballast tanks, and fuel tanks), tanker ship accidents (hull leaks, grounding, explosions, fires, and collisions), and bilge water, which are a mixture of wastewater, oil, and lubricants resulting from engine processes, ship scrapping, and others (Marzuki, 2019). Improper handling of oil spill waste can have adverse effects on the environment and human health.

One of the products that can be used to address oil spill waste is Oil Spill Dispersant (OSD) (Osborne *et al.*, 2022). OSD consists of surfactants, which reduce the density and interfacial tension between oil and water, breaking down the oil layer into smaller droplets (Merlin *et al.*, 2021). OSD does not alter the properties of the oil but helps form an emulsion between the oil and water (Prince, 2023). Currently, most commercial OSD products are based on petroleum-derived surfactants and may introduce additional pollutants if used. Therefore, OSD has the potential to develop in handling oil spill pollution by utilizing surfactants based on palm oil to have low toxicity and easy biodegradability (Elvina *et al.*, 2016; Chanif *et al.*, 2017).

PT Pertamina Research and Technology Innovation (RTI) has developed OSD products under the OSD Komersial X based on petroleum-derived surfactants (non-renewable) and imports, resulting in a Low Domestic Content Level (TKDN). Researchers at IPB (Elvina *et al.*, 2016; Chanif *et al.*, 2017) have successfully developed Bio-OSD using surfactants derived from palm oil (renewable). The surfactants used in the Bio-OSD formulation are anionic surfactant Methyl Ester Sulfonate (MES) and non-ionic surfactant Diethanolamide (DEA). The MES and DEA surfactants produced are renewable, environmentally friendly, and help maintain the sustainability of the raw material supply (Hambali *et al.*, 2019). Through collaboration with partners, efforts are made to increase the Local Content Level (TKDN) by replacing petroleum-derived surfactant raw materials with palm oil-based surfactants in OSD products with potential for commercialization.

PT Pertamina (Persero) is seeking an alternative to the existing non biodegradable OSD product, hereafter called OSD X, produced and marketed by PT Pertamina (Persero) by developing Bio-OSD products. However, Bio-OSD products need more information and designs regarding market aspects and marketing and marketing risk management. Bio-OSD products need information and testing of the market and marketing aspects to determine whether the product is feasible for commercialization. The perspective of the market and marketing is one of the main factors determining the

resilience or disappointment of an organization in business. Market and marketing aspects determine the survival of a company in the industry. The potential and opportunities in market and marketing aspects can't be separated from the occurrence of marketing risks that affect the company's sustainability (Rofa *et al.*, 2022). Therefore, assessment on risk-based marketing are needed for the market and marketing aspects of the Bio-OSD product.

This research aimed to analyze market and marketing aspects, and to risk-based design marketing strategies of Bio-OSD product. Bio-OSD is a surfactant produced by mixing palm oil-based anionic surfactant (Methyl Ester Sulfonate, MES) and non-ionic surfactant (Diethanolamide, DEA).

RESEARCH METHOD

Type and Source of Data

The collected data consisted of primary and secondary data. Primary data were obtained directly from PT Pertamina RTI through interviews, discussions, and questionnaires. Secondary data were obtained from company records, journals, literature studies, and other supporting documents.

Data Collection and Processing Method

Data were obtained directly from PT Pertamina RTI through distribution of questionnaires, followed by interviews and discussions with experts. The collected data consisted of information on demand, requirements, and availability of Bio-OSD products or similar products, the presence of competitors, and marketing strategies.

Market Analysis

The market analysis was carried out to asses market feasibility based on the needs and availability of OSD products in PT Pertamina (Persero), and to analyse market structure of Bio-OSD and potential competition with other OSD products (OSD X and OSD Y).

Marketing Strategy

The marketing strategy was developed by combining Segmenting, Targeting, and Positioning (STP) and the marketing mix (Product, Price, Place, and Promotion). The success of the STP marketing strategy is achieved when combined with the marketing mix (Nurmalina *et al.*, 2018).

Marketing Risk Management

The marketing risk management plan for the Bio-OSD product was assessed using the House of Risk (HOR) method. According to Pujawan and Geraldine (2009), the HOR method is a modification of the House of Quality (HOQ) method, incorporating Failure Mode and Error Analysis (FMEA). The House of Risk method consists of two phases, namely HOR Phase 1 and HOR Phase 2.

Table 1. Severity rating scale

Severity rating scale		
Scale	Severity	Description
1	No impact	Almost no impact or failure
2	Very light	The impact is very mild and does not interfere with the performance or quality of the company's business processes
3	Light	The impact is very mild and does not interfere with the performance or quality of the company's business processes
4	Minor	Minor impact and signs of disruption in the performance of the company's business processes
5	Medium	Moderate impact and the start of disruption in the performance of the company's business processes
6	Significant	Significant impact and disrupt the performance of the company's business processes
7	Large	Major impact and threaten the performance of the company's business processes
8	Very Large	The impact is very large and threatens the performance or quality of the company's business processes
9	Serious	The impact is very serious and threatens the performance or overall quality of the company's business processes
10	Dangerous	Very harmful impact on the performance or overall quality of the company's business processes

Table 2. Occurrence rating scale

Occurrence rating scale		
Scale	Occurrence	Description
1	No impact	Almost never happens
2	Very Few	A very small number of events occur
3	Few	Small or small number of events
4	Small	The number of occurrences is very low
5	Medium	Low number of events
6	Significant	Number of moderate events
7	Large	The number of occurrences is quite high
8	Very Large	High number of events
9	Serious	The number of occurrences is very high
10	Dangerous	Almost always happens

HOR Phase 1

Identification of risk events (E_i) and risk agents (A_i). Next, assigning severity and occurrence scale values for variables E_i and A_i from a scale of 1 to 10 (Triangular Fuzzy Number) in Table 1 and 2, evaluated by Experts.

- After that, creation of a correlation matrix between E_i and A_i, with values set as 0 for no correlation, 1 for weak correlation, 3 for moderate correlation, and 9 for strong correlation, assessed by Experts. Next, calculation of the value of Aggregate Risk Potential of Agent j (ARP_j) using Equation 1 as follows:

$$ARP_j = O_j \sum S_i R_{ij} \text{ .... (1)}$$

Explanation:
- ARP_j : Aggregate Risk Potential (risk priority index)
- O_j : Risk occurrence level (Occurrence)
- S_i : Risk impact level (Severity)
- R_{ij} : Correlation between risk agent and risk

- Ranking ARP based on the highest to lowest values using the ABC classification method (Ulfah *et al*., 2016) and Pareto diagram.
- Creating a Pareto diagram for risk agent Aj's prioritization.

HOR Phase 2

Data entered into HOR 2 consists of the prioritized risk agents (A_i) based on the ranking classification and Pareto diagram. Next, formulation of mitigation actions or preventive actions (PA_k) based on the priority of A_i. Assessment of the difficulty level in implementing PA_k using a Likert scale, evaluated by Experts. Established a correlation relationship between A_i and PA_k with values of 0, 1, 3, and 9, assessed by Experts. After that, calculation of the total effective value can be determined based on Equation 2 as follows:

$$TE_k = \sum ARP_j E_{jk} \text{ .... (2)}$$

Explanation:
- TE_k : Total Effectiveness

ARP_j : Prioritization of the risk agent (risk priority index)

E_{jk} : Correlation value between a risk agent and risk handling

- Calculation of the total effectiveness to difficulty ratio (ETD_k) can be calculated based on Equation 3 as follows:

$$ETD_k = \frac{TE_k}{D_k} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3)$$

Explanation:

ETD_k : Effectiveness to difficulty of ratio

TE_k : Total Effectiveness

D_k : The level of difficulty in carrying out prevention efforts to be implemented in the company (Difficulty).

- Finally, determination of the ranking of each risk mitigation action according to the ETD_k value obtained using the ABC classification method (Ulfah *et al*., 2016) and Pareto diagrams.

Experts Survey

Expert survey was conducted using questionnaires and direct interviews. For this survey, five selected experts consisted of one academicians who is expert specializing in commercialization and forth practitioners who are specialized in OSD research and development, new renewable liquid commercial development, hydrocarbon commercial development and innovation strategy.

RESULTS AND DISCUSSION

Market Analysis

The market analysis was conducted by assessing market feasibility based on product needs and availability, market structure, and comparing the marketing performmance of Bio-OSD product with its competitors.

Market Feasibility Analysis

Market feasibility is determined by evaluating OSD products' current needs and availability (OSD X) in circulation. The demand and availability of OSD products are influenced by several factors, including the volume and handled oil, operational regions, and environmental policies and regulations. Data on the demand and availability of OSD products were obtained from two subsidiaries of PT Pertamina (Persero): PT Pertamina Hulu Energi, an industrial company engaged in oil and gas exploration, exploitation, and production in offshore locations, and PT Pertamina International Shipping in Sub-Holding Integrated Marine Logistics, an industrial company engaged in oil and gas transportation and logistics in offshore locations.

Based on data obtained from PT Pertamina Hulu Energi for 2022, the operational regions are divided into four regions in Indonesia, each with different oil characteristics. The total demand for OSD products in Sub holding Upstream, with 17 industries located in offshore areas in 2022, was 15,383 liters. The total availability of OSD products in Sub holding Upstream was 37,682 liters. These data indicate that the availability of OSD products has exceeded the demand. Additionally, the OSD consumption data for 2022 at PT Pertamina International Shipping in Sub holding Integrated Marine Logistics amounted to 49,025 liters per year.

Based on the data on the demand and availability of OSD products, the market opportunity for Bio-OSD products demonstrates the ability to fulfil the unmet demand and availability of OSD products. Therefore, Bio-OSD products are considered a positive replacement for the currently circulating OSD X because the price is cheaper, contains TKDN (regulations), and the company's focus on using environmentally friendly products. The Bio-OSD product is deemed feasible for commercialization to PT Pertamina Hulu Energi, engaged in oil and gas exploration, exploitation, and production in offshore locations, as well as other subsidiaries of PT Pertamina (Persero), including PT Pertamina Lubricant, PT Pertamina International Shipping, and PT Kilang Pertamina Internasional.

Analysis of Market Structure and Competitor Status

Currently, the widely available OSD products are made from petroleum-based surfactants. Raw materials are imported, including OSD X, produced by PT Pertamina (Persero) and OSD Y as a competitor. The Bio-OSD product is intended to replace the functionality of OSD X. Based on interviews and analyses conducted, the market structure for Bio-OSD products in Indonesia is classified as a monopoly. Furthermore, the Bio-OSD product is grounded in innovation through market-driven development based on technology push, enabling innovative product development. Table 3 compares the Bio-OSD product and the competitor OSD products.

Based on the data shown in Table 2, the Bio-OSD product outperforms its competitor products in terms of effectiveness, performance, and pricing. The effectiveness parameter of the Bio-OSD product meets the dispersant effectiveness standard set by the Environmental Protection Agency (EPA) at 45% for light and medium crude oil. The product's performance parameter meets the standard quality requirements. It does not affect the chemical properties of seawater at dilution ratios of 1:20, 1:25, and 1:30, thereby possessing a higher competitive advantage than commercial OSD products and offering lower usage costs. In terms of pricing, the Bio-OSD product is priced 37.5% to 72.0% lower than the commercial OSD products. Therefore, the Bio-OSD product demonstrates a higher level of market feasibility than commercial OSD products.

Table 3. Comparison of Bio-OSD products with competitor OSDs

Indicator	Commercial OSD X	Bio-OSD	Commercial OSD Y
Specifications	ρ = 1005.9 kg/m3 SG = 1 pH = 7-8 Color = yellowish	ρ = 1000.4 kg/m3 SG = 1 pH = 8-10 Color = yellowish	ρ = 1086.0 kg/m3 SG = 1 – 1.25 pH = 7-8 Color = yellowish
Function	OSD, Aqueous Film-Forming Foam (AFFF), and Degreaser	OSD	OSD, Degreaser and Liquid Foam
Effectiveness	Below standard	Meet standards	-
Performance	Not worth applying at dilutions of 1:0, 1:25, 1:30	Applicable at dilutions of 1:0, 1:25, 1:30	Not worth applying at dilutions of 1:0, 1:25, 1:30
Types of surfactants	Petroleum (Non-renewable)	Palm oil (Renewable)	Petroleum (Non-renewable)
Content (ℓ)	25	25	25
Price (IDR/ℓ)	80,000	50,000-80,000	180,000
Licence	Directorate General of Oil and Gas Certification	Patent Certificate IDP000057788	Directorate General of Oil and Gas Certification

Business to Business Marketing Strategy Design

The marketing strategy for the Bio-OSD product is Business to Business (B2B) marketing, incorporating the STP (Segmenting, Targeting, and Positioning) approach and the 4Ps marketing mix. The B2B marketing strategy is tailored to suit the existing business processes within PT Pertamina (Persero). The B2B marketing process involves the Bio-OSD product, produced by PT Pertamina RTI, commercialized to other subsidiaries of PT Pertamina.

Segmenting, Targeting, and Positioning Analysis

According to Kotler and Armstrong (2016), marketing strategies consist of three stages: segmenting, targeting, and positioning. Market segmentation involves understanding the needs and desires of consumers, while target marketing is the evaluation, selection, and reach of specific consumer groups as potential customers. The subsequent step is market positioning, which aims to create a positive perception of the product in the minds of consumers. These strategies collectively enhance the market penetration and acceptance of the Bio-OSD product, ensuring its successful commercialization and recognition among target customers.

Segmenting

According to Hulu *et al.* (2021), market segmentation is a crucial factor in business activities involving introducing a specific branded product and corporate image to ensure that the target market is aware of and considers the company's position among competitors. The market segmentation strategy offered by the company tailored to each consumer group. The market segmentation for the Bio-OSD product was based on geographic and business market segmentation, encompassing local, national, and international markets. The segmentation targets companies in the oil and gas industry. Specifically, PT Pertamina (Persero) subsidiaries operating in national and international regions engaged in oil and gas exploration, exploitation, production, and distribution.

Targeting

Targeting is selecting the markets that become the target of segmentation results, allowing the company to specify the markets it aims to capture. The application of target marketing enables the company to determine and develop the product's position to the offerings (Rosyida *et al.*, 2020). After formulating the market segmentation strategy based on the desired markets, it is evident that PT Pertamina RTI's target market for the Bio-OSD product includes oil and gas-based industrial subsidiaries operating in both national and international regions, particularly those with oil-contaminated waters involving light and medium crude oil. The Bio-OSD product is also targeted at environmentally conscious industrial companies.

Positioning

Positioning refers to determining the product's position in the minds of consumers. This process occurs after selecting and evaluating the most potential market segments, which become the target for marketing the product. Positioning involves formulating the product's placement in the competition and specifying the detailed marketing mix (Wijaya and Sirine, 2016). The positioning of the Bio-OSD product is as a diversified product in the

business. Additionally, the product is competitive over competitor products due to its renewable nature and demonstrated effectiveness and performance in line with industry standards.

Marketing Mix Analysis

According to Hooley *et al.* (2017), properly implementing the marketing mix is the key to the success of a product in achieving its objectives. The marketing mix design consists of controllable factors: product, price, place, and promotion (4P). The right marketing mix strategy can maximize sales opportunities in the market (Kotler and Armstron,g 2016).

Product

Product is everything offered to the market for purchase and can satisfy consumer needs. Bio-OSD products can be identified in several aspects:

Product Variations

The current condition of Bio-OSD products is capable of handling oil-contaminated waters with effectiveness and performance that meet the standards. The next plan for OSD product variations is to make the product applicable to oil spill-contaminated land. This expand the utilization of Bio-OSD products to address broader pollution impacts.

Brand

Bio-OSD product uses the brand "Pertasurf Bio-OSD". The company utilizes the brand name "Pertasurf Bio-OSD" to indicate that this product is a variant of OSD Komersial X. The brand name also reflects using sustainable raw materials from palm oil.

Packaging

Bio-OSD product is packaged in 25-litre plastic jerry cans. The jerry can packaging protects the product during transportation and distribution. Plastic material is chosen for its strength and durability in safeguarding the product from damage or leakage during transit.

Price

Price is an essential factor in marketing. The set price should reflect the value of the product and follow market standards. PT Pertamina RTI sets the price for Bio-OSD with a competitive pricing strategy. The offered price for Bio-OSD is 20% lower than OSD Komersial X and lower than that of similar products from competitors (OSD Komersial Y). This competitive pricing strategy aims to make Bio-OSD a more appealing choice for customers seeking high-quality products at a more affordable price.

Place

The marketing strategy for Bio-OSD involves the distribution of the product to the targeted market. Bio-OSD will be distributed through PT Pertamina

(Persero) subsidiaries such as PT Pertamina Lubricant, PT Pertamina International Shipping, and PT Kilang Pertamina Internasional. Distribution will occur through integrated distribution channels to reach national and international markets. Bio-OSD will be available online through e-commerce platforms to facilitate access for customers needing the product.

Promotion

Promotion is a crucial part of introducing the product to the market. PT Pertamina RTI will employ various promotional methods to increase awareness and interest in the Bio-OSD product. The promotional methods include print and online media advertising, brochures and leaflets, participation in industry exhibitions, and promotional activities on social media. PT Pertamina RTI will collaborate with relevant parties and business partners to expand the reach of Bio-OSD promotion.

Marketing Risk Management

Risk refers to adverse or hazardous outcomes during business operations (Arifudin *et al.*, 2020). Marketing plays a vital role in determining a company's success. Inappropriate marketing strategies can lead to risks (Rahmatin *et al.*, 2018). Marketing risks are unfavorable events that have the potential to occur and are known for their significant impact if they indeed happen in all business activities associated with the flow of goods and services from producers to consumers. Risks can be managed through a risk management process, which aims to reduce the possibility of loss and increase the possibility of gain (Wibowo, 2013).

Marketing Risk Analysis (HOR Phase 1)

According to Pramudita and Erlambang (2022), the analysis in HOR phase 1 is used to determine which risk agents are prioritized for implementing risk prevention measures in marketing the Bio-OSD product at PT Pertamina RTI, focusing on three types of risks: market risk, technical risk, and consumer risk (Rahmatin *et al.,* 2018). Severity and occurrence values are provided by experts from the PT Pertamina RTI and Surfactant and Bioenergy Research Center at IPB University, to assess the marketing risk conditions of the Bio-OSD product. Additionally, severity and occurrence assessments are provided by academic experts, namely professors from IPB University, to offer evaluations in line with the company's situation. The total number of experts used in the HOR phase 1 analysis is seven experts.

Results of Marketing Risk Identification and Assessment

Marketing risk identification was conducted through interviews conducted by field experts and academics, field observations, and literature reviews. The marketing risks faced by the industrial

company, in general, are market risk, technical risk, and consumer risk. Each risk has different risk occurrences based on the marketing issues faced. In addition to identification, severity assessment is also carried out for each risk occurrence based on evaluations made by the experts. The final assessment of severity value was determined by the mode value from the assessments provided by each expert. The scale used to measure the severity level of risk occurrences is the Triangular Fuzzy Number scale (1-10). The Triangular Fuzzy Number scale provides a more comprehensive and accurate measurement of risk severity values. Based on the rating scale, the results of identifying risk events with a final severity assessment can be seen in Table 4.

The risk occurrences with the highest severity values are improper handling of goods (E4), product susceptibility to damage (E5), product rejection by consumers due to damage (E7), failure to create brand recognition (E8), and insufficient consumer awareness of the product (E9), each with a severity value of 7 (major). The risk occurrences with the lowest severity values are fluctuating sales not meeting targets (E1) and delayed delivery of goods to consumers (E6), each with a severity value of 4 (minor).

Results of Identification and Assessment of Marketing Risk agents

Identification of risk agents is based on risk events that have been identified in the previous stage. Risk agents are identified to anticipate the recurrence of risk events. Identification of risk agents is generated from interviews and discussions with expert practitioners of companies and academics, as well as literature studies. According to Anggrahini *et al.* (2015), each identified risk agent can cause one or more risk events and vice versa. In addition to identifying, an assessment of the occurrence of each risk agent is also carried out based on an assessment carried out by an expert. The final assessment of the occurrence value is determined by the mode value from each expert's assessment results. The scale used to measure the severity of a risk event is the Triangular Fuzzy Number scale (1-10). The results of identifying risk agents with the final occurrence assessments can be seen in Table 5.

The risk agents with the highest occurrence values are the lack of innovation and product differentiation (A8) and the emergence of competitors (A10), both rated as 7 (high). On the other hand, the risk agent with the lowest occurrence value is the lack of product quality control, rated as 2 (very low).

Table 4. Results of identification and assessment of marketing risk events

Main processes	Sub process	Risk events	Code	Severity
Marketing Risk	Market Risk	Sales that fluctuate and do not meet the target	E1	4
		Product price competition	E2	6
		Demand forecasting errors	E3	5
	Technical Risk	Improper handling of goods	E4	7
		Perishable products	E5	7
		Goods get to consumers not on time	E6	4
		Products rejected by consumers because they are defective	E7	7
		Failure to create a brand	E8	7
	Consumer Risk	Consumers are less familiar with the product	E9	7
		Consumer purchasing power decreases	E10	6

Table 5. Results of identification and assessment of sources of marketing risk

Risk Agent	Code	Occurrence
Lack of product quality control	A1	2
The occurrence of human error	A2	5
Incompatibilities in information systems	A3	3
Poor supply chain handling	A4	3
Work done manually	A5	3
Lack of product promotion and branding	A6	5
The occurrence of delays during product delivery	A7	5
Lack of innovation development and product differentiation	A8	7
Instability of economic conditions	A9	6
The emergence of competitors	A10	7

HOR Model Phase 1

Figure 1 represents the HOR model phase 1. The HOR model phase 1 shows the severity, occurrence, and correlation values of events and risk agents and the relationship between risk agents in the marketing of Bio-OSD products. he correlation between risk events and sources means one event may lead to one or more risk agents. The correlation is expressed on a scale of 0, 1, 3, and 9, based on the degree of their relationship. A value of 0 indicates no relationship at all, 1 indicates a weak relationship, 3 indicates a moderate relationship, and 9 indicates a strong relationship. The relationship between risk agents is integral to the HOR phase 1 model. This relationship is depicted as the upper part or roof of the HOR phase 1 model. The relationships are represented using symbols, including the Δ symbol indicating no relationship, the $\circ$ symbol indicating a weak relationship, the Θ symbol indicating a moderate relationship, and the $\bullet$ symbol indicating a strong relationship. Code A_i is the risk agent, E_i is the risk event, O_i is the occurrence, S_i is the severity, and ARP is the aggregate risk potential of the agents.

Priority of Marketing Risk agents

The prioritization of risk agents is carried out to categorize which risk agents require immediate mitigation. This prioritization is done by calculating the Aggregate Risk Potential (ARP) to determine the numerical value of the risk for each risk agent using severity, occurrence data, and the correlation value

between risk agents and risk events. The prioritization of risk agents helps identify the priority levels of risk agents with the highest to the lowest likelihood of causing risk events, allowing for risk mitigation to reduce issues that may arise in marketing Bio-OSD products. The process of classification uses the ABC classification method. According to Ulfah (2016), the Pareto diagram used follows an 80:20 ratio, leading to the ABC classification method categorized into three classes: A (high risk), B (medium risk), and C (low risk). Classification A represents risk agents that contribute to 50% of the total risk, classification B represents risk agents that contribute to 30% of the total risk, and Classification C represents risk agents that contribute to 20% of the total risk. Risk agents fall within 80% of the total preventive actions as priority risk agents.

Figure 2 is a Pareto diagram for priority sources of risk. Pareto diagram shows the sequence or ranking of risk agents from the highest to the lowest ARP value. Based on the results of calculating the ARP value, the risk agent with the highest ARP value is the occurrence of human error (A2), with a percentage of 18.56% of all identified risk agents. The risk agent with the lowest ARP value is work done manually (A5), with a percentage of 3.64% of all identified risk agents. The risk agents that have calculated the ARP value are then subjected to ABC classification to categorize them at high, medium, and low. The results of the ARP value and classification of risk agents are shown in Table 6.

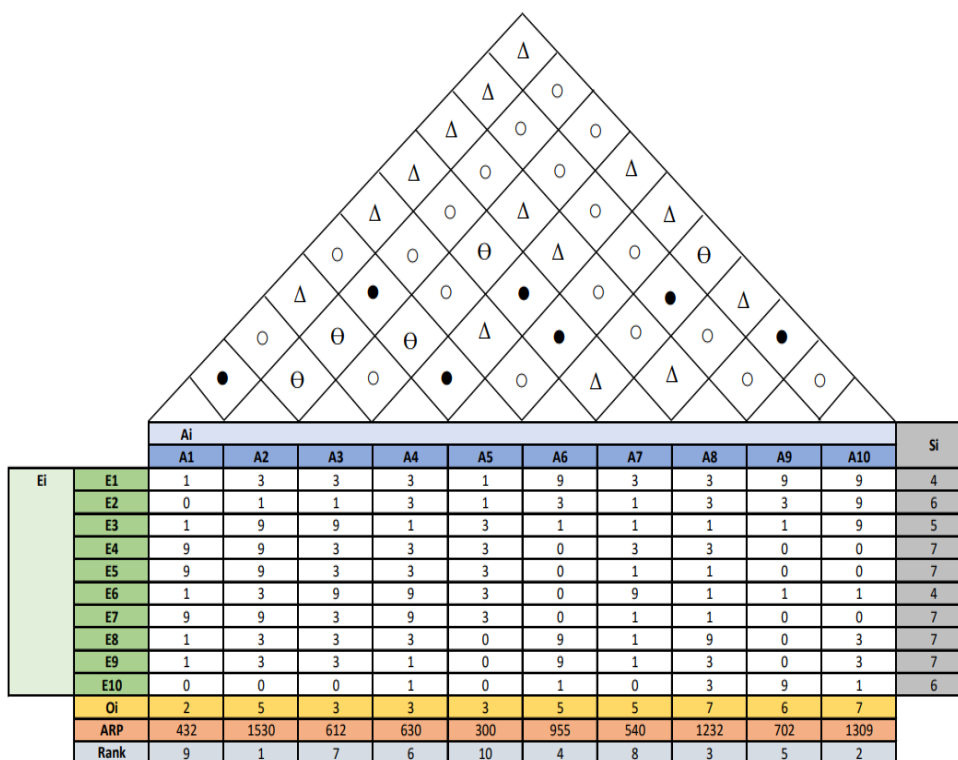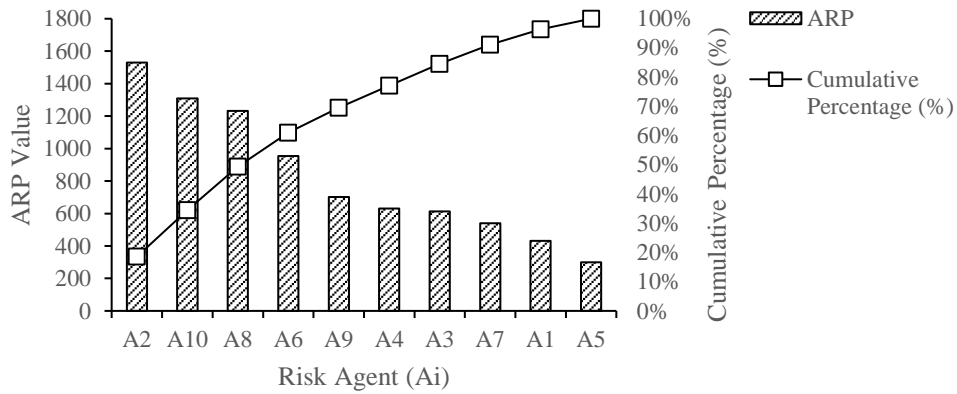| Ei		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	Si
	E1	1	3	3	3	1	9	3	3	9	9	4
	E2	0	1	1	3	1	3	1	3	3	9	6
	E3	1	9	9	1	3	1	1	1	1	9	5
	E4	9	9	3	3	3	0	3	3	0	0	7
	E5	9	9	3	3	3	0	1	1	0	0	7
	E6	1	3	9	9	3	0	9	1	1	1	4
	E7	9	9	3	9	3	0	1	1	0	0	7
	E8	1	3	3	3	0	9	1	9	0	3	7
	E9	1	3	3	1	0	9	1	3	0	3	7
	E10	0	0	0	1	0	1	0	3	9	1	6
Oi		2	5	3	3	3	5	5	7	6	7	
ARP		432	1530	612	630	300	955	540	1232	702	1309	
Rank		9	1	7	6	10	4	8	3	5	2	

Figure 1. HOR Model Phase 1

Figure 2. Pareto chart of priority sources of marketing risk

Table 6. ARP value and classification of marketing risk sources

Rank	Code	ARP value	Percentage risk agent (%)	Cumulative percentage (%)	Classification
1	A2	1530	18.56	18.56	High*
2	A10	1309	15.88	34.45	
3	A8	1232	14.95	49.39	
4	A6	955	11.59	60.98	Moderate**
5	A9	702	8.52	69.50	
6	A4	630	7.64	77.14	
7	A3	612	7.43	84.57	Low***
8	A7	540	6.55	91.12	
9	A1	432	5.24	96.30	
10	A5	300	3.64	100.00	

*High : cumulative percentage value between 0-50%
**Moderate : cumulative percentage value between 51-80%
***Low : cumulative percentage value between 81-100%

Based on the data in Tables 7 there are results of the classification of risk agents into high, medium and low categories to obtain priority risk agents. The high category is obtained from the cumulative percentage value between 0-50% with the results of human error (A2), the emergence of competitors (A10), and the lack of development of innovation and product differentiation (A8). The medium category is obtained from a cumulative percentage value between 51-80%, with the result of a lack of product promotion and branding (A6), unstable economic conditions (A9), and poor supply chain handling (A4). The low category is obtained from the cumulative percentage value between 81-100% with the results of discrepancies in information systems (A3), delays during product delivery (A7), lack of product quality control (A1), and work done manually (A5). Therefore, four priority sources of risk have been selected for which prevention or mitigation strategies need to be designed, as shown in Table 5.

Table 5. Priority of marketing risk agents

Priority of risk agent	Code	Occurrence
The occurrence of human error	A2	5
The emergence of competitors	A10	7
Lack of innovation development and product differentiation	A8	7
Lack of product promotion and branding	A6	5

Marketing Risk Mitigation Design (HOR Phase 2)

After the HOR phase 1 analysis, four priority sources of risk were obtained, which would then design the marketing risk mitigation through HOR phase 2. Pramudita and Erlambang (2022) suggest that HOR phase 2 prioritises actions by considering effective resources. The total number of experts used in the HOR phase 2 analysis was seven experts.

Results of Identification and Assessment of Marketing Risk Mitigation Actions

HOR phase 2 risk mitigation can be identified based on priority results and classification or categorization of risk agents previously obtained through the HOR phase 1 method. The identification results of risk mitigation actions are then measured by the Degree of Difficulty (D_k) using a Likert scale with a value range of 1-5. A score of 1 indicates very easy to apply, 2 indicates easy to implement, 3 indicates being implemented, 4 indicates difficult to implement, and 5 indicates very difficult to implement. The design of risk mitigation actions comes from interviews with experts and literature studies. Based on the identification results, the results of the identification of mitigation actions with the D_k assessment of identified risk mitigation, along with the degree of difficulty, are shown in Table 6.

Phase 2 HOR Models

Figure 3 is the House of Risk model phase 2. The House of Risk (HOR) model phase 2 shows the values of ARP, D_k, ETD_k, correlation values of source priorities and risk mitigation actions, and the relationship between mitigation actions in the marketing of Bio-OSD products. The correlation between priority risk agents and risk mitigation actions is expressed on a scale of 0, 1, 3, and 9. A value of 0 indicates no correlation, 1 indicates a weak correlation, 3 indicates a moderate correlation, and 9 indicates a strong correlation. The relationship between risk mitigation actions is depicted as the top or roof of HOR 2. The relationship is depicted using symbols. These symbols consist of the △ symbol indicating no relationship, the ○ symbol indicating a weak relationship, the Ө symbol indicating a moderate relationship, and the ● symbol indicating a strong relationship. ARP code is aggregate risk potential, PA_i is risk mitigation action (preventive action), A_i is priority source of risk, D_k is Degree of Difficulty, ETD_k is Effectiveness to Difficulty.

Priority of Marketing Risk Mitigation Action

Figure 4 is a Pareto diagram for priority risk mitigation actions. Risk mitigation actions are prioritised according to the ETD_k value for each identified mitigation action. The ETD_k value is generated from the correlation value between risk agents and risk mitigation actions, along with the level of difficulty of risk mitigation actions obtained previously.

Table 6. Results of identification and assessment of marketing risk mitigation actions

Risk mitigation actions	Code	Difficulty
Conduct employee training and capability development	PA1	2
Monitoring and analyzing marketing data regularly	PA2	2
Monitoring and analyzing marketing data regularly	PA3	3
Conduct market research through in-depth analysis of consumer needs and preferences	PA4	4
Improve product quality, features and uniqueness	PA5	3
Build a strong and unique brand image	PA6	4
Execute a smart pricing strategy	PA7	3
Developing target markets through product differentiation and diversification	PA8	4
Shaping and expanding corporate partnership strategies	PA9	4
Expanding promotional media	PA10	3

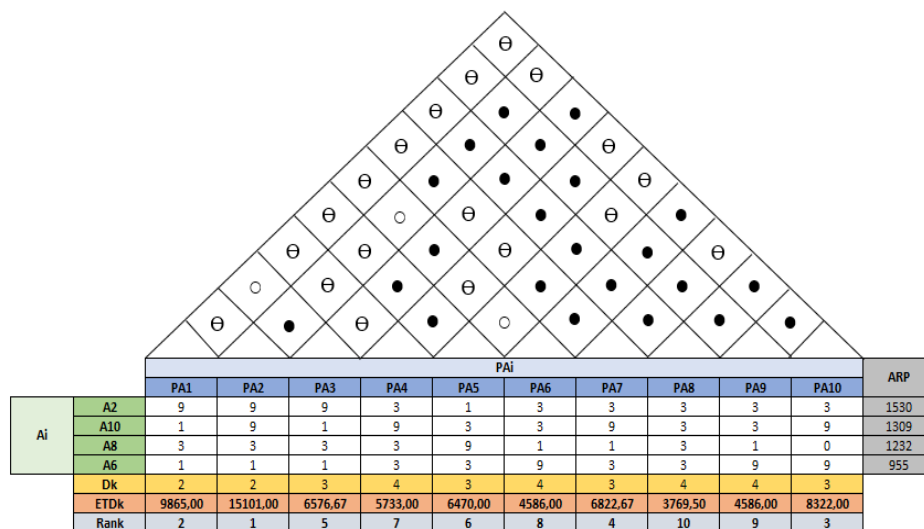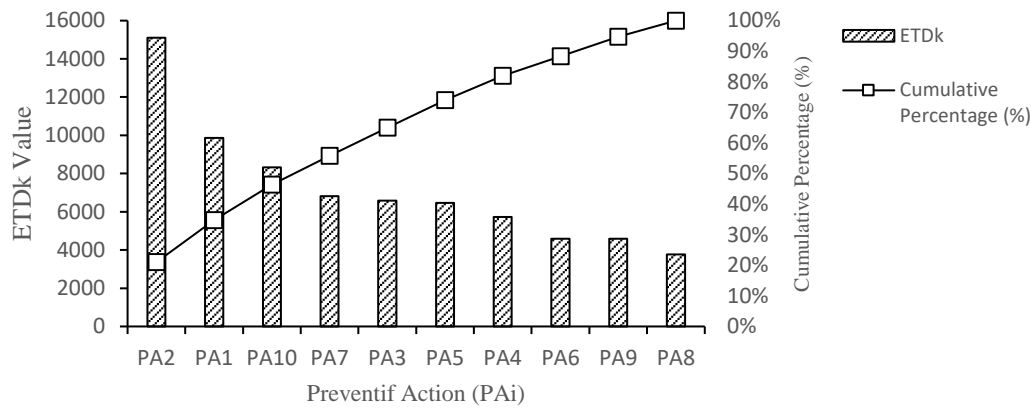| Ai		PA1	PA2	PA3	PA4	PA5	PA6	PA7	PA8	PA9	PA10	ARP
	A2	9	9	9	3	1	3	3	3	3	3	1530
	A10	1	9	1	9	3	3	9	3	3	9	1309
	A8	3	3	3	3	9	1	1	3	1	0	1232
	A6	1	1	1	3	3	9	3	3	9	9	955
	Dk	2	2	3	4	3	4	3	4	4	3	
	ETDk	9865,00	15101,00	6576,67	5733,00	6470,00	4586,00	6822,67	3769,50	4586,00	8322,00	
	Rank	2	1	5	7	6	8	4	10	9	3	

Figure 3. Phase 2 HOR Model

Figure 4. Pareto chart of marketing risk mitigation priorities

Tabel 7. ETD_k value and classification of marketing risk mitigation actions

Rank	Code	ETD_k value	Risk mitigation actions percentage (%)	Cumulative percentage (%)	Classification
1	PA2	15101.00	21.02	21.02	
2	PA1	9865.00	13.73	34.76	High*
3	PA10	8322.00	11.59	46.34	
4	PA7	682267	9.50	55.84	
5	PA3	6576.,67	9.16	65.00	Moderate**
6	PA5	6470.00	9.01	74.00	
7	PA4	5733.00	7.98	81.98	
8	PA6	4586.00	6.38	88.37	Low***
9	PA9	4586.00	6.38	94.75	
10	PA8	3769.50	5.25	100.00	

*High : cumulative percentage value between 0-50%
**Moderate : cumulative percentage value between 51-80%
***Low : cumulative percentage value between 81-100%

A high ETDk value means that the mitigation action is a priority to be implemented first to reduce risk events. The risk mitigation action with the highest ETD_k value is regular monitoring and analysis of marketing data (PA2) with a percentage of 21.02% of the total identified mitigation actions, while the risk mitigation action with the lowest ETD_k value is developing the target market through product differentiation and diversification (PA8) with a percentage of 5.25% of the total identified mitigation actions. The results of the ETD_k values and the classification of risk mitigation actions are shown in Table 7.

Based on the data in Table 7, there are results of the classification of risk mitigation actions into high, medium and low categories to obtain priority risk mitigation actions. The high category is obtained from a cumulative percentage value between 0-50%, with the results of PA2, PA1, PA10. The medium category is obtained from a cumulative percentage value between 51-80% with the results of PA7, PA3, and PA5. The low category is obtained from a cumulative percentage value between 81-100% with the results of PA4, PA6, PA9, and PA8. Therefore, three priority risk actions were selected,

as shown in Table 8. The three priority risk mitigation actions must be implemented managerially in the marketing process for Bio-OSD products.

Table 8. Priority of marketing risk mitigation actions

Risk mitigation action priorities	Code	Difficulty
Monitoring and analyzing marketing data regularly	PA2	2
Training and development for improving employees' capability	PA1	2
Expanding promotional media	PA10	3

CONCLUSIONS AND RECOMMENDATION

Conclusions

Based on the results of market analysis, it can be concluded that Bio-OSD products made from palm surfactants are technically feasible for commercialization. The results of the market feasibility test for Bio-OSD products provide positive

values and have advantages over competing OSD products. The advantages of Bio-OSD products compared to competing OSD products are that they have superior quality in terms of product effectiveness and performance and 37.5-72.0% cheaper prices.

The Business to Business marketing strategy design results in segmentation and target markets aimed at PT Pertamina (Persero) subsidiaries operating in waters polluted by light and medium types of petroleum waste, with the position of Bio-OSD products as a diversification product in the business. The design of the 4P marketing mix strategy produces products that meet the needs and its standards with (range of price) of IDR 50,000 to IDR 80,000/L. The location (place) of the industry is recommended in Java Island with a direct distribution system to deliver and sale the of products. Product promotions are carried out both online and offline. Three priority risk mitigation actions were selected from ten risk events and four priority sources of marketing risk, namely monitoring and analyzing marketing data regulary (PA2), training and development for improving employees' capability (PA1), and expanding promotional media (PA10). Therefore, the company has sufficient consideration to market Bio-OSD product and manage its marketing riks.

Recommendation

A comprehensive feasibility evaluation is neccessary to assure the success of production and commercialization of Bio-OSD. Since this research was limited on the assessment of merketing aspect, it is recommended to in the future to assess techno-economical and operational management aspects to establish a feasible Bio-OSD manufacturing industry.

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