Strategic Alliance As A Business Strategy In Setting Up A Vaccine Factory (Case Study Of Pt Bandung Vaksin Sentosa)

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A R T I C L E   I N F O

A B S T R A C T

Indonesia, with a population of over 270 million, offers a growing vaccine market, driven by strong immunization programs and post-COVID awareness. CZBP proposes a joint venture with PT BVS to establish a vaccine facility focusing on downstream processes. A financial feasibility study will evaluate investment costs, expected revenue, risks, and the project's long-term impact on national biopharmaceutical independence. It will also assess repayment capability, funding options, and financing strategies. The project requires IDR 363.69 billion, with the best outcome through a strategic partnership, achieving an NPV of IDR 2.778 trillion, IRR of 45.30%, and a Payback Period of 4.31 years.

INTRODUCTION

Indonesia's health status still faces various challenges, especially related to equal access to health services, the quality of health facilities, and the high number of infectious and non-communicable diseases. Although the government has expanded access through the National Health Insurance (JKN), the gap between urban and rural areas is still large. Infectious diseases such as tuberculosis, malaria, and polio are still major problems, while non-communicable diseases such as diabetes and hypertension continue to increase due to lifestyle changes and urbanization.

Vaccination plays an important role in improving public health. Through the national immunization program, vaccination is effective in preventing the spread of diseases such as polio, hepatitis, and measles. Childhood immunization is an important pillar of public health. It helps reduce child mortality and disease incidence, while providing positive socio-economic impacts.

According to the United Nations Inter-Agency Group Report on Child Mortality Estimates (2023), the infant mortality rate in Indonesia is still high at 22 deaths per 1,000 live births. The government's mission is to improve public health by promoting vaccination to prevent deaths from vaccine-preventable diseases.

In Indonesia, with a population of more than 270 million and expected to grow to 324 million by 2045, the need for vaccines is very high. Government support through business incentives, ease of licensing, and technology transfer attracts many investors, including Chinese pharmaceutical companies. The advantages of Chinese companies, such as innovative products, affordable prices, and high quality are a serious challenge for local pharmaceutical companies. The Indonesian pharmaceutical industry must face this competition with two strategies: improving technology, efficiency and innovation, or

collaborating with Chinese companies. This partnership will provide technology transfer, access to innovative products and increased competitiveness in domestic and international markets. This step has strategic interests to support the country's health care system and face global competition in the pharmaceutical sector.

CZBP Co., Ltd, one of the leading pharmaceutical companies in China, is interested in entering Indonesia and investing and collaborating in the domestic pharmaceutical industry. Established in 2002, CZBP has an efficient research and development system with an excellent technology platform for polysaccharide and conjugated polysaccharide vaccines. With 6 vaccine patents, 8 patents in the registration process, and 19 unpatented technologies, CZBP's strength lies in continuous innovation and competitiveness.

CZBP offers PT BVS (Bandung Vaksin Sentosa) the establishment of a joint venture company aimed at supporting the government's program in providing affordable new medicines and vaccines and financing the development and innovation of biopharmaceutical technology in Indonesia. In addition, this partnership is expected to produce innovative health products developed and available to the Indonesian people in China.

The joint venture company plans to build a biopharmaceutical factory that will handle downstream processes such as formulation, filling, packaging, and labeling until the product is ready for sale. Then further developed into upstream processes such as seeding, cultivation, and purification to produce pharmaceutical raw materials (BBO/API). The purpose of this factory is to produce innovative products that previously could only be produced by multinational companies.

The initial stage of the factory focuses on downstream processes (filling and packaging) and then formulating products so that they can be marketed quickly. Vaccine raw materials in the form of bulk concentrates will be imported from partners in China. This collaboration is expected to create national independence in the biopharmaceutical sector, both downstream and upstream processes.

To ensure the success of this investment and cooperation plan, it is essential to conduct a comprehensive financial feasibility study. This study will include an evaluation of various aspects such as the estimated cost of building the plant, analysis of expected revenue, return on investment, risk analysis, and the long-term impact on national independence in the biopharmaceutical sector. After that, it will analyze whether building the new vaccine facility is economically feasible, by looking through costs, revenue projections, and key performance indicators such as NPV, IRR, and Payback Period. It will also identify which factors, such as vaccine price, pricing strategy, production cost, or operational efficiency, have the greatest impact on the project's financial outcomes. Lastly, it will explore and recommend the best funding approach while ensuring the strategy aligns with the company's financial structure and long-term stability.

Capital Budgeting

Capital budgeting refers to the method of assessing and choosing long-term investment options that aim to enhance the wealth of shareholders in the company (Gitman and Zutter, 2015). The capital budgeting process starts with identifying potential projects or investments that align with the organization's strategic goals. After that, the assessment of the initial expenses required to initiate the project, including asset purchases, initial operational costs, or any other pertinent expenditures will be done. The organization forecasts the cash inflows (revenue) and cash outflows (costs) that the project will produce over a specified timeframe.

There are several methods in the capital budgeting. However, this research will focus on the four (4) most commonly used:
1. Payback Period

According to Gitman and Zutter (2015), payback period is "the amount of time required for a firm to recover its initial investment in a project as calculated from cash inflows." It is calculated by dividing the initial capital expenditure or cost of investment with the annual cash flow.

2. Discounted Payback Period

Discounted Payback Period is an investment evaluation method that calculates the time required to recoup the initial investment cost, taking into account the time value of money. Unlike the conventional payback period, this method discounts future cash flows using a certain discount rate before calculating the payback period.

3. Net Present Value

Net present value is the amount of discounted cash flow minus the amount of discounted costs. If the NPV is greater than zero, it indicates that the return exceeds its discount rate and the additional value is created. The formula of NPV:

$$NPV = \sum_{t=1}^{n} \frac{CF_t}{(1+r)^t} - CF_0$$

4. Internal Rate of Return

IRR is a discount rate that makes the future's present value after-tax cash flow equal to the investment outlay. The internal rate of return, or IRR, is a measure utilized in financial analysis to assess the potential profitability of investments.

$$NPV = 0 = \sum_{t=1}^{n} \frac{CF_t}{(1+IRR)^t} - CF_0$$

$$\sum_{t=1}^{n} \frac{CF_t}{(1+IRR)^t} = CF_0$$

US' Index Theory

The "US' Index theory" can be utilized as a guide during the loan analysis process because the value of the US' Index reflects the true conditions at the time a business seeks loans from the bank (Siahaan, 2019). The objective of the US' Index is to evaluate the potential repayment ability of a company by comparing its Basic Business Profitability (BBP) with the Loan Interest Rates (I), and it is expressed as follows:

US Index=(Basic Business Profitability)/(Loan Interest Rate)

Basic Business Profitability represents the profit margin of a company generated from its business operations, which can be financed through debt/loans or equity capital. BBP is calculated as follows:

BBP= (Earning before Interest and Taxes)/(Total Assets) x 100%

Based on the US' Index theory, the meanings of US' Index values are as follows:

US' Index > 1 indicates that the company might consider increasing its debt financing.

US' Index < 1 suggests that the company should think about enhancing its equity financing.

US' Index = 1 means that the company has the flexibility to choose either debt or equity to fund its assets, depending on its appetite for financing.

RESEARCH METHOD

The research will be conducted in quantitative method and mostly performed through desktop research. Quantitative research is a research approach that uses numerical data, calculations, and statistical methods to analyze phenomena and answer research hypotheses. According to Creswell & Creswell (2017), quantitative research involves numerical measurements in various aspects of research, from planning to drawing conclusions. In general, this approach is very suitable for use in studies that require data certainty, statistical analysis, and validation of results through empirical data. Quantitative data is usually collected through surveys, experiments, or direct measurements, then analyzed with statistical tools to obtain objective and repeatable results.

Firstly, the author identifies the business issue at PT BVS and subsequently defines the research questions and research objectives as a guideline during performing the research. The author then proceeds with the business issue analysis. After doing a thorough examination of the business problem, the author will explore the underlying theories and literatures that related to the business issue and provide basis for further research analysis. The author continues with the data collection, data calculation and analysis and summarize the findings and provide recommendation.

This research will gather the required data and information from both primary and secondary resources. Primary data is retrieved from PT BVS internal project information, such as project capital expenditures (CAPEX), operational expenditures (OPEX), and revenues. Meanwhile the secondary data is being collected from external institutions and similar company in the same industry, such as loan interest, country risk free rate, market risk premium, applicable taxes and others. The combined data of primary and secondary will be used in data analysis stage.

After completing the data and information collection, research continues with data analysis that is performed in quantitative method. The data will be mathematically calculated and simulated to give comprehensive understanding of the financial situation for the business opportunity. Data analysis will include the followings: Project cashflow analysis (Revenues, CAPEX, OPEX), Weighted Average Cost of Capital (WACC) analysis, Payback Period (PBP), Discounted Payback Period, Net Present Value (NPV), and Internal Rate of Return (IRR). It till also include US Index, sensitivity analysis, and the source of funds

RESULTS AND DISCUSSION

The planned Capital Expenditure (CapEx) for the vaccine factory includes building preparation (land work, permits, and architectural structures), specialized vaccine production areas (cleanrooms and utilities like piping and HVAC systems), and procurement of key equipment (autoclaves, filling machines, and LAF units). It also covers design phases, contractor costs, and qualification processes to meet international pharmaceutical standards.

Table 1 summarizes the capital expenditure for this project:

Table 1. CapEx

Investment lists	Total (IDR)
Land	29,700,000,000
CoD & BoD	2,900,000,000
Qualification & Validation	3,654,000,000
Facility	159,620,160,000
Manufacturing equipments	135,795,364,715
TOTAL CAPEX	331,669,524,715

Based on data obtained from 'BioPharm Insight, industry analysts report, A.T. Kearney Analysis' which analyzes the cost structure in large pharmaceutical companies from year to year, the cost structure applied for this project is the cost of goods sold (COGS) is around 32% of the selling price or revenue, selling and sales administration costs reach 30% of the selling price, research & development costs are around 15% of the selling price, and licensing costs and factory overhead are around 7% of the selling price. However, considering that R&D costs will be imposed more by the CZBP, and the strength of the marketing network and low marketing costs for the government market in Indonesia, there is an adjustment regarding the proportion of these costs, especially for sales costs and R&D costs. Based on the considerations, the percentage of R&D costs becomes 10%.

Table 2. OpEx

Operating Costs	Percentage from revenue
COGS	32%
selling and administrative costs	30%
research & development	10%
licensing fees and factory overhead	7%

The main source of income for this vaccine factory comes from the production and sale of various types of superior vaccines designed to meet domestic and international immunization needs. Products to be sold include ACYW135 Meningococcal Polysaccharide Vaccine, ACYW135 Meningococcal Conjugate Vaccine, Influenza Vaccine, 13-Valent Pneumococcal Conjugate Vaccine, 23-Valent Pneumococcal Polysaccharide Vaccine, DTaP-Hib Vaccine, and Mycobacterium Vaccae for Injection. Vial solvents are produced to dissolve dry or lyophilized vaccines into a liquid form that is ready to use. Therefore, the solvents will not be sold.

Table 3. Revenue Projection

Vaccines	2029	2030	2031	2032
ACYW135 Meningococcal Polysaccharide Vaccine	83,197,048,350	107,532,184,993	126,013,383,187	130,297,838,215.20
ACYW135 Meningococcal Conjugate Vaccine	201,515,852,858	260,459,239,819	305,223,501,169	315,601,100,208.43
Influenza	93,736,725,337	121,154,717,499	141,977,174,946.00	146,804,398,894.16
13Valent Pneumococcal Conjugate Vaccine	347,242,953,227	448,811,517,046	525,947,256,441.73	543,829,463,160.75
23 Valent Pneumococcal Polysaccharide Vaccine	176,581,497,095	228,231,584,995	267,456,986,736.07	276,550,524,285.10
Dtap-HIB	305,433,949,909	394,773,380,257	462,621,765,210.25	478,350,905,227.40
Mycrobacterium Vaccae for Injection	352,626,379,883	455,769,595,999	534,101,197,230.83	552,260,637,936.67
Total Revenue	1,560,334,406,658	2,016,732,220,606	2,363,341,264,920	2,443,694,867,928

It is the projected revenues of the vaccines where for the first three years the production number is different. Therefore, the revenue calculation for the first three years is different as well. The price will be set at 65% of the market price. However, in the fourth year and onwards the number of the vaccines produced will be the same, while the price increases 3.4% per year, based on the average inflation, until the last year.

Table 4. General Assumptions

Tax	22%
Discount Rate	14.50%
Risk free rate	6.9%
Beta	1.03
Equity risk premium	7.38%
The increase in product prices annually	3.4%
Depreciation (straight line)	20

The Indonesian government has issued the Tax Regulation Harmonization Law No. 07/2021, which sets the corporate income tax rate at 22% starting from the fiscal year 2022 onward. The discount rate used in this analysis is 14.5%, derived from the cost of equity, assuming the project is entirely funded by equity. The Equity Risk Premium applied is 7.38%, based on Damodaran's data updated in January 2024. This figure reflects the additional return expected by investors for investing in equities over risk-free assets.

The Risk-Free Rate is 6.9%, corresponding to the yield on the Indonesian Government Bond with a 20-year maturity, as issued by the Indonesian Stock Exchange. The Beta coefficient used is 1.03, sourced from Damodaran's January 2024 update for the pharmaceutical industry. This levered beta value is chosen as it closely represents the risk profile of the evaluated industry.

Annual product price increases are based on Indonesia's average inflation rate over the past decade. Moderate inflation allows the pharmaceutical sector, including vaccines, to adjust product prices regularly without significantly impacting demand, given the essential nature of its products. Twenty (20) years of economic life for the fixed assets have been chosen based on typical design life time for the equipment in the pharmaceutical industries. By using the Straight-Line method, the physical assets will be depreciated at equal percentage over the economic life of the project. In this analysis, the depreciation calculation will assume at zero salvage value.

To determine those four indicators, we need to calculate the Free Cash Flow (FCF) of the project over the life time. Once the FCF over the project life time have been determined, the result must be discounted by using the selected discount rate to obtain the discounted free cash flow. As mentioned before, the discount rate is gained from the cost of capital where the equity is 100%, and there is no debt.

Table 5. Cash Flow and Discounted Cash Flow

Year	Total Cash Flow	Accumulated Cashflow	Discounted Cash Flow	Accumulated Discounted Cash Flow
0	(140,766,675,000)	(140,766,675,000)	(140,766,675,000)	(140,766,675,000)
1	(84,814,829,400)	(225,581,504,400)	(74,073,181,114)	(214,839,856,114)
2	(46,069,645,800)	(271,651,150,200)	(35,139,314,069)	(249,979,170,182)
3	(92,041,674,609)	(363,692,824,809)	(61,312,937,161)	(311,292,107,343)
4	259,225,153,411	(104,467,671,397)	150,811,324,096	(160,480,783,247)
5	333,983,115,336	229,515,443,938	169,695,578,786	9,214,795,539
6	390,757,676,794	620,273,120,733	173,397,462,662	182,612,258,201
7	403,919,596,967	1,024,192,717,700	156,537,843,571	339,150,101,773
8	417,529,022,426	1,441,721,740,125	141,318,914,968	480,469,016,740
9	431,601,168,350	1,873,322,908,475	127,580,835,082	608,049,851,822
10	446,151,767,235	2,319,474,675,710	115,179,356,984	723,229,208,806
11	461,197,086,483	2,780,671,762,192	103,984,304,248	827,213,513,054
12	476,753,946,585	3,257,425,708,777	93,878,195,972	921,091,709,026
13	492,839,739,930	3,750,265,448,707	84,755,006,477	1,005,846,715,503
14	509,472,450,249	4,259,737,898,956	76,519,046,446	1,082,365,761,949
15	526,670,672,719	4,786,408,571,676	69,083,953,588	1,151,449,715,537
16	544,453,634,753	5,330,862,206,429	62,371,782,070	1,213,821,497,607
17	562,841,217,497	5,893,703,423,926	56,312,181,023	1,270,133,678,631
18	581,853,978,053	6,475,557,401,979	50,841,653,395	1,320,975,332,026
19	601,513,172,468	7,077,070,574,447	45,902,887,264	1,366,878,219,290
20	621,840,779,494	7,698,911,353,941	41,444,152,512	1,408,322,371,801
21	642,859,525,158	8,341,770,879,099	37,418,756,462	1,445,741,128,263
22	664,592,908,175	9,006,363,787,275	33,784,552,687	1,479,525,680,950
23	687,065,226,215	9,693,429,013,489	30,503,497,804	1,510,029,178,754

Based on the result, this project shows a very promising investment potential. With a discount rate of 14.50% that reflects the expected return, this project generates positive Net Present Value of 1.51 trillion Rupiahs. The positive NPV indicates that this project not only returns the initial investment, but also provides significant added value to the company.

In addition, the high Internal Rate of Return value of 45.53% really exceeds the discount rate or the expected return of 14.50%. It indicates that the return is very attractive compared to the cost of capital. In terms of return on investment, this project takes about 4.31 years to reach the nominal breakeven point (payback period). If we take into account the time value of money, the time required is slightly longer, which is 4.95 years (discounted payback period). This shows that although the return on investment takes time, the future cash flow provides a large return after that period.

Although the feasibility analysis previously performed based on full equity financing, PT BVS may explore the possibility to use debt financing for this project. US Index can be used to analyze repayment capacity of the loan applicant, monitor loans, and guiding loan restructuring and repayment process. It is used within financial institutions on assessing the influence of leverage on profitability and loan quality. For the US Index analysis, the author uses interest rate of 8.5% based on assumption of the domestic bank financing rate.

Table 6. US' Index Theory Result

AVERAGE EBIT	623,461,320,633.94
Total Asset	363,692,824,808.59
BGP	1.71%
Interest rate	8.5%
US INDEX	0.20167676

Given that its US' Index was < 1 then increasing loan value to PT BVS would be decrease its profitability and negatively impact to its repayment capacity to the Bank. With US Index value less than 1, it shows that leverage negatively affect profitability, leading to higher financial risk and potential challenges in managing debt. PT BVS must maximize equity over the debt, as the project cash flow generated is being considered not sufficient to cover the debt. As alternatives, PT BVS must improve cash flow management by enhancing revenue streams and cost reduction, or performing debt restructuring by extending the loan tenure, reducing the interest rate, or converting some debt into equity to lower immediate repayment obligations.

The author has identified key variables that may impact the project's feasibility: capital expenditure, market risk, operational expenses, and the discount rate. Changes in construction, equipment, and installation costs affect financial viability, while market fluctuations, sales volume, and competition impact revenue. Operational expenses, including COGS, selling expenses, and R&D, must also be considered for sensitivity to cost increases. Additionally, the sensitivity of NPV to changes in the discount rate helps assess financial risks. These variables are simulated with +10% and -10% adjustments from the baseline, and their impact on NPV, IRR, Payback Period, and Discounted Payback Period is analyzed through sensitivity analysis.

Table 7. Sensitivity Analysis

	Base NPV	+10% NPV	-10% NPV	Pctg. +10% NPV	Pctg. -10% NPV
Operational Expenditure	1,510,029,178,753.77	830,740,297,898.49	2,189,318,059,609.05	-44.99%	44.99%
Discount rate	1,510,029,178,753.77	1,290,035,717,754.88	1,773,767,143,272.28	-14.57%	17.47%
Market Risk	1,510,029,178,753.77	1,690,599,640,753.28	1,329,458,716,754.27	11.96%	-11.96%
Capital Expenditure	1,510,029,178,753.77	1,478,899,968,019.46	1,541,158,389,488.08	-2.06%	2.06%

From the sensitivity table, it can be concluded that operational expenditure is the most sensitive variable and has the most significant impact to the NPV. Higher operational expenditure than the expected can significantly reduce NPV by up to 44.99%, while the lower operational expenditure can increase NPV by up to 44.99%. It shows that operational cost management is crucial for project sustainability. The increase in COGS, R&D, selling expenses, and licensing has to be anticipated and if possible kept low.

Changes in the discount rate or cost of capital can reduce NPV by up to 14.57%. If the discount rate decreases, NPV can increase by up to 17.47%. This risk is related to macroeconomic conditions, including monetary policy and inflation.

For the source of funds, this study employs five scenarios, namely full equity, domestic bank loan, strategic partnership, corporate bond, and capital intensive. After the calculation of WACC, with different debt and equity ratios, the study finds the result shown in the table 8:

Table 8. Source of Funds

	Base Case	Domestic Bank Loan	Strategic Partnership	Corporate Bond	Capital Intensive
Debt	0.00%	50.00%	50.00%	50.00%	20.00%
Equity	100.00%	50.00%	50.00%	50.00%	80.00%
Cost of Debt	0.00%	8.50%	5.00%	9.00%	8.50%
Cost of Equity	14.50%	14.50%	14.50%	14.50%	14.50%
WACC	14.50%	10.57%	9.20%	10.76%	12.93%
IRR	45.53%	45.53%	45.53%	45.53%	45.53%
NPV (in billion IDR)	1,510.00	2,360.00	2,778.00	2,650.00	1,798.00
Payback Period	4.31%	4.31	4.31	4.31	4.31
Discounted Payback Period	4.95%	4.74	4.68	4.75	4.86

Based on the analysis, the option to loan from Strategic Partnership with the composition of 50% debt and 50% equity is the best option. This option provides the highest NPV of 2.778 trillion Rupiahs and the fastest Discounted Payback Period of 4.68 years. Strategic partnerships provide another attractive avenue, particularly for projects with an international dimension. These partnerships often provide access to large capital pools and lower interest rates. They can also facilitate efficient portfolio management, particularly for procurement needs such as technology or imported materials.

CONCLUSION

The collaboration to build a new vaccine facility is economically feasible, as the feasibility analysis reveals positive outcomes. With a discount rate of 14.5%, the project shows an NPV of 1.510 trillion Rupiahs, an IRR of 45.30%, a Payback Period of 4.31 years, and a Discounted Payback Period of 4.95 years. The most sensitive factor affecting the project's feasibility is operational expenditures, with a 10% increase reducing NPV by up to 44.99%. Therefore, efficient cost management is crucial.

The optimum financing strategy involves a strategic partnership with a 50% debt and 50% equity composition, which offers the highest NPV of 2.778 trillion Rupiahs and the quickest Discounted Payback Period of 4.74 years. The project is also feasible and realistic for the company to pursue, given its alignment with government policy and strong profit potential. With proper risk mitigation, including cost management and technology partnerships, the expansion is achievable.

PT BVS should complete the feasibility study by ensuring all technical, financial, and legal factors are fully addressed. A strategic partnership with 50% debt is recommended for optimal funding, providing

the highest NPV and lowest capital costs. The company should seek international technology partners for licenses and technology transfers, obtain the necessary permits, and implement strict project monitoring systems to avoid delays and cost overruns. Additionally, recruiting and training local workforce and ensuring production meets international standards will be key to success.

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