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A Feasibility Study on the Expansion of Production Capacity of CV XYZ

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Abstract, Objective *– This feasibility study aims to analyze whether or not this project will be profitable for the company and to understand what can the owner of the company expect regarding the return of this investment.* ***Methodology*** *– The study has employed a quantitative approach to evaluate the feasibility of expanding the handbag and backpack manufacturing company, CV XYZ. The specific techniques include NPV, IRR, profitability index, and payback period.* ***Findings*** *– The analysis shows that the project has a positive net present value at 15% discount rate, a 21% internal rate of return, and a profitability index of 1.29. This shows that the expansion should be implemented as it will be a profitable investment.* ***Novelty*** *– The study essentially conducted a standard feasibility analysis for a business expansion project. While the specific context is a handbag and backpack manufacturing company, the methodology and analysis are typical for such projects.*

Keywords: *net present value, internal rate of return, profitability index, payback period*

1. INTRODUCTION

Business process is defined as a quantifiable set of activities and procedures that make use of the firm's critical resources to deliver specified output for a particular customer (Laakso, 1997). This means that the success of a company is highly determined by the resources that it procures and the output that it produces. This is especially true for businesses that operate in the manufacturing industry. The United States Department of Commerce defined manufacturing industry as an industry that "comprises establishments engaged in the mechanical, physical or chemical transformation of materials, substances, or components into new products," and also an industry that "assembles component parts of manufactured products" (Levinson, 2017). In essence, manufacturers are those that converts input into output, rather than just selling a finished product or service.

As other industries experience, companies in the manufacturing industry may also go through stagnation. Stagnation is a state where a business' growth in productivity is decreasing (Clougherty et al., 2020). In this case, productivity may refer to output production, sales, and profitability. This state of stagnation is undesired as businesses tend to aim for greater growth. For the manufacturing industry, this translates to a decline in growth of output that a company produces. Consequently, as producing output is the main business process of a manufacturing company, sales and profitability might stop growing or even decline along with the output.

This is the exact scenario that CV XYZ is currently experiencing. CV XYZ is a bag manufacturing company that was established in 2001 by Ir. Bambang Pariadjie and Ir. Maria Katharina Pariadjie. Similar to other manufacturing companies, it highly depends on its input to produce its output. However, CV XYZ has reached its maximum capacity of production

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with the current infrastructure that they have. This creates a problem as this means that it cannot further increase its output, resulting in a stagnation. In order for CV XYZ to leave its current stagnant state, the ability to further its output is necessary.

To expand further from the problem background stated above and this stagnation period of CV XYZ, it is necessary to understand what this company had done in order to alleviate the situation, like automation. Automation is an addition of technology to existing process in order to reduce resources needed for production while improving the speed of production allowing a business to achieve more output with less input (Nimawat & Shrivastava, 2016). The company had undergone automations in several aspects of their production chain. Such aspects that had received some forms of automations are inspection and cutting of raw materials, pressing of materials, and sewing. These allowed the company to reduce their required labor while increasing their speed of production, effectively increasing their productivity.

The key issue that CV XYZ is currently facing is the stagnation of its output. Limited production capacity at only 35,000 units per month even though the company received more than 50,000 units of orders per month disallows the company from producing more output, effectively reducing their productivity. Rising costs of input also results in reduction of profitability. To solve these problems, an expansion is necessary in order to increase production capacity.

The company produced a huge array of different bags according to the specification of the clients and many of them have elaborate designs or patterns that require a human to manually sew and assemble them. Because of this issue, most of the production processes in CV XYZ cannot be fully automated. This means that it cannot increase its output capacity through automation any longer and they are still heavily dependent on employees. The inability to increase its output resulted in CV XYZ being unable to receive more orders from their current business partners or other potential partners. Furthermore, with the high dependency on direct labor, profitability had been declining as well as wages increased. Therefore, a feasibility study on the possibility of expanding their production capacity needs to be urgently conducted in order for CV XYZ to get out of this stagnation period.

2. LITERATURE REVIEW

Market Analysis

According to market research done by CV XYZ, the handbag and backpack manufacturing market in Indonesia is mainly divided into two according to the markets, domestic and export. Most small-sized bag manufacturing companies in Indonesia provide their services for

domestic clients while large-sized ones provide their services for international clients. In fact, many of the large-sized bag manufacturing companies in Indonesia are owned by foreign owners. For example, there has been an increase in factories owned by Korean based companies in Indonesia to supply products to high-level international brands. The number of companies with differing scales of operation makes gauging the total output of the industry impossible to do. Some of the companies can produce only hundreds to thousands of bags per month while the large ones can produce hundreds of thousands of units monthly.

CV XYZ is a mid-sized company with the operational structure of large sized company, albeit in a smaller scale, that provides its services to domestic clients. There are not many mid-sized bag manufacturing companies currently in Indonesia due to previous difficulties caused by Covid-19. Typically, mid-sized companies take on more receivables compared to smaller ones and many of them had failed to collect them amidst the pandemic. Some of them also have only one or two clients, which caused their cash flow to be dependent only to those certain clients. Due to the economic difficulty during the pandemic, many of these clients were not able to pay their debts and the manufacturing companies could not continue their operations. This resulted in the current undersupply of handbags and backpacks manufacturing capacity, allowing CV XYZ to comfortably compete in the domestic market. Demand for bags has also started to recover after the pandemic as bags in many forms have become a necessity for people especially when going out.

As for handbag and backpack retailers, who are CV XYZ's main clients, their market in Indonesia is going through changes due to the popularity of online shops. In the past, there are several huge retailers that are well-known by the public such as Sophie Martin. However, with the increase in small scale retailers through online marketplaces, it is hard for a company to gain a big market share in the industry as there are many options for consumers. It is hard to get an accurate data on the total output of this industry due to the number or small retailers, similar to manufacturing industry. Some of current retailers that has gained a foothold in the industry are Matahari, Local.id, and Berrybenka. These companies however, could not obtain the level of market share that a company like Sophie Martin had reached in the past.

SWOT Analysis

SWOT analysis will be conducted in order to better understand the position of CV XYZ in the market. This analysis method provides insight on the internal and external factors that may affect a business (Gurel & Tat, 2017). The internal factors are divided into strengths and weaknesses while the external factors are divided into opportunities and threats. The internal and external factors are also known as organizational and environmental factors. Basically,

strengths and weaknesses refer to factors that came from the organization itself while opportunities and threats are factors that came from outside of the organization or the environment. Here is a SWOT analysis table for the current condition of CV X:

Figure 1. SWOT Analysis Table

Strengths

Having the operational structure of large-sized company as a mid-sized company allows CV XYZ to take on orders of larger quantity from domestic clients compared to its competitors. It also has the ability to produce better quality products that are more standardized. Moreover, CV XYZ is able to sustain more receivables from their clients with their cash reserves that smaller sized companies may not have. This allows it to obtain projects with bigger order and longer duration, resulting in higher, more consistent revenue stream.

The structure that mimics larger companies of CV XYZ also allows for easier future expansion by not having to do an overhaul of their operational and organizational structure. As it has applied this structure for quite some time, it had already hired competent people for several managerial or department head positions in the company. Also, CV XYZ already has an array of clients who know its production capabilities be it quality or quantity. This is an advantage that cannot be easily obtained by new companies or other companies that are trying to get to this scale.

Weaknesses

Even though CV XYZ is capable of sustaining more receivables, this also means that it is taking more risks compared to its competitors. In the event that it cannot collect those receivables, this may result in huge liquidity problem and operation as a whole may be halted. Furthermore, its larger scale compared to their competitors in the domestic market brings higher fixed cost. If in the future demand ever dwindles, it may not be possible for CV XYZ to sustain the cost longer than its competitors. CV XYZ also has a weakness of not having enough production capacity for the current demand in the market. It currently has a production capacity of 35,000 units per month while they are receiving orders of around 55,000 units a month. This can be an issue as some of these potential clients may look to other companies to fulfill their production needs.

Opportunities

With the low competition on its scale as competitors stopped operating due to the pandemic, there are many potential clients with supply problems that CV XYZ can cater to. As CV XYZ is already experienced in the domestic market, the increase in demand while the market is being undersupplied presents an opportunity for it to gain more business in the domestic market. Also, as previously established, the bag manufacturing industry is divided into domestic and export markets. For CV XYZ, this presents another opportunity for it to tap into the export market as well. The supply chain disruption in China coupled with the prolonged pandemic there also caused many businesses to plan to move their manufacturing out of China which means that part of this demand will go to Indonesia. An increase in demand in the domestic market may also happen as Indonesia's economy is growing as a whole. As more people move upwards into middle-class income bracket, their purchasing capacity will increase, allowing demand for handbags or backpacks to increase.

Threats

A disruption in demand and clients failing to repay their payables in time remain to be a looming threat to CV XYZ. As mentioned in the market analysis, many companies with similar size to CV XYZ had failed to survive during the pandemic due to the same reasons. These kinds of unexpected environmental factors may cause a sudden shortage of demand and cash flow which may result in the inability to continue operation. However, an unexpected event of that scale can be considered very rare and may not happen again in the near future. Inflation may also become a threat to CV XYZ as with high inflation, input cost will go up while the

purchasing power of customers will go down. This will result in a decrease in revenue with cost of goods increasing, effectively decreasing the profit margin as well.

Another threat to CV XYZ would be larger sized corporations that has started opening factories in Indonesia. Even though almost all of them are currently catering to international clients instead of local clients, they may be thinking of expanding their business to the local market if they have the capacity. Moreover, as these large-sized companies opened their factory in Indonesia, they may consider poaching people who already have the experience working in the field. This may become a threat to CV XYZ's workforce.

Possible Strategy

According to the SWOT analysis conducted above, CV XYZ has to get rid of its weakness of not enough production capacity in order to stay competitive in the current market. There is an opportunity in the form of increasing demand that can only be utilized with enough production capacity. Moreover, threats from larger companies that may expand to the domestic market require CV XYZ to urgently apply this expansion. The aforementioned strength of this company in which it already has the organizational and operational structure of a large-sized company will allow this expansion to take place without needing an exorbitant amount of capital.

3. METHODOLOGY

Operational Process

Below is the operational process in CV XYZ. The operation flow goes from sampling, to inventory, to cutting, to production, and finally to packaging. Below is the breakdown of each process of the operation.

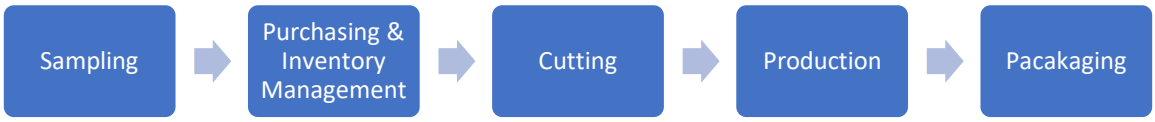

Figure 2. Flow Chart of CV XYZ's Operational Process

Sampling

When a client first goes to CV XYZ, the client must describe the kind of bag that they want. After the client gives the description of their expected specification, the sampling team will create a design of the product using an application that will later be made into a sample

made out of paperboards. The client then can either provide revisions or approve the sample before choosing materials and accessories for the bags. Afterwards, another sample will be made using the materials and accessories chosen for final approval. When the final approval is obtained, a production card detailing specifications of the product will be made and sent to the inventory department.

Figure 3. Paperboard Sample

Figure 4. Production Card

Purchasing & Inventory Management

There are two warehouses in the factory, accessories warehouse and the materials warehouse. After receiving the production card, inventory management division must check whether or not the specified accessories and materials are available in the warehouses. If it is not, they must report to purchasing department so they can order the required materials. After the materials and accessories are procured, they are sent to inventory management in order to be inspected. If they passed the inspection process, the materials will be sent to the cutting department while the accessories are delivered straight to production department.

Figure 5. Accessories Warehouse

Figure 6. Materials Warehouse

Figure 7. Materials Inspection Machine

Cutting

The cutting department will start by determining the appropriate measures of cutting the materials. There are two main ways to cut the materials, using laser cutting or clicker press cutting. Laser cutting is a material cutting method that is not labor intensive as it uses a machine that is fully automated. It follows a predetermined pattern in a computer program and will cut the material accordingly. Clicker press cutting, on the other hand, requires a person to operate them. They utilized a clicker die of a certain shape that is put on top of the material before going into the machine that will press the clicker die on the material to cut it. Ideally, laser cutting would be used as much as possible, as it is cheaper with less labor and it is more

accurate. However, not every material can be cut using the laser cutting machine. This is because the edges of the material that comes into contact with the laser will be burned which will not allow paint to stick to the material. Hence, there needs to be a separation of cutting method according to the needs.

Figure 8. Clicker Press Cutting

Figure 9. Laser Cutting Machines

Production

The production is the most complex part of the factory's operation. The production starts with a preparation stage that is separated into three sections, painting, folding, and computer sewing. True to its name, the painting section paints the material or parts of the material according to what is needed in the final product. Similarly, the folding section folds the material so that it would fit the requirements of sewing later on. Computer sewing is done for parts of the product that is not complex and can be taken care of using a computer program.

After the preparation stage, the materials that have been prepared will be transferred to the production line. There are a total of 7 production lines currently in CV XYZ, with each going

from sewing to assembling and finally to quality control. Most of the laborers in this factory work in sewing in the production line. They are responsible of sewing different parts of the final product together or parts of the final product that is not possible to be sewn using computer sewing. After these parts are put together, they will then be assembled with their accessories in the assembly section before being checked by the quality control section to be approved for release.

Figure 10. Production Line

Packaging

The packaging section is the last part of the operations before the final products got sent to the client. The products will be filled with inflated plastic bags or paper to maintain its shape and then put into boxes, plastic bags, or paper bags according to what the client needs. After being packaged, the items can then get sent out of the factory to be delivered to the client.

Figure 11. Packaging Area

Location

CV XYZ's office and factory is located in Cileungsi, Bogor. The office and factory have a total building area of around 1,600 square meters on top of around 4,000 square meters of land. The owners are planning to build another factory in the empty parts of the land that is owned by CV XYZ, where the expansion is planned to happen. This location is strategic for bag manufacturing factory as many of Indonesia's sewers (a person who sews) are located here.

This means that CV XYZ's location is close to the human resources that it needs. Most companies that are located further from this area had to be build a housing for their laborers to live in, which is not the case for CV XYZ. Cileungsi is also close to Jakarta, Indonesia's city with the strongest economy where most of their clients operate in.

Production Capacity

With its current factory, CV XYZ is capable of holding 7 production lines. Each line can produce approximately 5,000 units of bags in a month. In spite of that, throughout the year 2021, only 5 production lines had been active in CV XYZ. The reason being that demand had not fully recovered after the pandemic. In 2022, it has started operating with its full capacity of 7 production lines, bringing their production capacity to 35,000 units in a month. However, this level of production capacity is not enough as it received a total order of 55,000 units currently, which is 20,000 units more than what the factory can handle. This means that this number of orders has gone unfulfilled. As such, the owner of CV XYZ is contemplating about increasing the production capacity by building another factory. By their estimation, the new factory will be able to hold 6 more production lines, increasing the total production capacity to 65,000 units per month.

4. RESULTS AND DISCUSSIO

Feasibility study is the analysis of a project in order to decide whether a project should be implemented or not (Matson, 2000). The study should be conducted under several assumptions like the investments needed, machineries and technologies used, and projection of the financials. An economic feasibility study evaluates factors that can be quantified in monetary terms, with the possibility of the project determined in terms of monetary value as well (Chen, 1998). This includes the use of several evaluation methods and metrics such as NPV, IRR, payback period, and profitability index.

Net Present Value

NPV refers to the total present value of an investment over the course of multiple years (Chen, 1998). This financial metric is calculated by adding the present value of future cash flows starting from the initial investments up to the designated calculation year. The present year that is used to calculate the present value of future cash flows is usually referred to as year zero which is the year when the evaluation is carried out. A predetermined discount rate will be applied to the calculation to discount the value of future cash flows related to the value at the present time. In the case of an investment, the discount rate that will be used is the expected rate of return that the investor would like to earn. The formula for calculating NPV is,

$$NPV = -C_0 + \frac{C_1}{1+r} + \frac{C_2}{(1+r)^2} + \cdots + \frac{C_n}{(1+r)^n}$$

where,

C_0 = Initial Investment

C = Cash Flow

IRR = Internal Rate of Return

n = time period

Internal Rate of Return

IRR calculation is done in order to calculate the discount rate in which an investment would have zero NPV (Newnan & Eschenbach & Lavelle, 2012). The result is then used to determine whether or not the investment should be carried out by comparing it with the required rate of return of the investor. If the value of IRR is bigger than the required rate of return, the investment should then be proceeded. The formula for calculating IRR is,

$$-C_0 + \frac{C_1}{1+IRR} + \frac{C_2}{(1+IRR)^2} + \cdots + \frac{C_n}{(1+IRR)^n} = 0$$

where,

C_0 = Initial Investment

C = Cash Flow

IRR = Internal Rate of Return

n = time period

Payback Period

Payback period is used to calculate the amount of time that is needed for an investor to recoup the invested amount according to projected future cash flows (Baker & Powell, 2005). There are two kinds of payback period calculation, undiscounted payback period (simply known as payback period) and discounted payback period. The former uses the face value of the cash flows and the second one utilizes the present value of the cash flows.

Profitability Index

Profitability index is used to calculate the profitability of an investment. It is calculated by dividing the present value of future cash inflows with the present value of future cash outflows (Baker & Powell, 2005). A value of lower than 1 indicates that the investment is not profitable while values greater than one indicates that the investment is profitable.

Major Assumptions

There are several assumptions regarding the financials that has to be made in order to do the feasibility study. Some of these are projections that will be made by utilizing data from CV XYZ's income statement of the year 2021. Previous years are not included as the operations were heavily impacted by Covid-19, causing CV XYZ to shift its production from producing handbags and backpacks to producing Personal Protective Equipment (Alat Pelindung Diri in Indonesian). Projections will be adjusted for inflation with sales growing at 2% YoY assuming same number of sales and cost of goods and wages growing at 3% YoY. The discount rate that will be used in this study is 15%, as even though the company is not a start-up, it already has orders from potential clients waiting for their production capacity to be increased.

There will also be some other projections that are made using estimations by the owner of CV XYZ themselves. This includes the prices of the machineries, building price, new building capacity, number of employees needed for expansion and the production capacity per production line. The new building is estimated to have a capacity of 6 production lines, with each production line being able to produce around 5,000 units of bags per month, leading to 30,000 units increase in monthly production capacity. Each production line will require 52 workers to operate. There will not be an increase in general and administrative expenses other than marketing expenses as the owner explained that they had been preparing for this expansion for quite a while and had prepared the appropriate organizational structure to expand.

Capital Investments

The capital investments needed to start the expansion of CV XYZ's production capacity is divided into two, fixed capital investment and working capital investment. The total capital investment needed is Rp 16,518,758,197 which will be broken down below between fixed capital investment and working capital investment.

Fixed Capital Investment

The fixed capital investment that is needed will be used to build the new factory and to purchase machineries. The cost of building the new factory is estimated to be Rp 4,000,000,000 while the price of machineries that are needed per production line is Rp 589,500,000. With the new building having the capacity of holding 6 production lines, a total of Rp 3,537,000,000 will be needed to purchase the full array of machineries for all 6 production lines. The total fixed capital investment needed is Rp 7,537,000,000. Below is the list of machineries needed per production line:

Working Capital Investment

The assumption for working capital investment needed will be based on the cost of goods that CV XYZ accumulated in the year 2021. As the production in the year 2021 was based on only 5 production lines, the expenses will be adjusted for 6 production lines in which the new factory of CV XYZ will operate with. CV XYZ's cost of goods for 5 production lines in the year 2021 amounts to Rp 29,939,139,989. For 6 production lines operating for a full year, the projected cost of goods will be Rp 35,927,032,786. CV XYZ usually purchases its materials according to orders and rarely stocks up on materials. However, on average it takes 3 months to collect on receivables, which means that a working capital investment for the first 3 months of operation is required. This brings the total working capital needed to continue with the expansion to Rp 8,981,758,197.

Table 1. List of Machineries per Production Line

Machinery Needed per Production Line		
Machinery	**Amount**	**Price (in Rp)**
Large Sized Sewing Machine	3	22,500,000
Medium Sized Sewing Machine	4	11,250,000
Small Sized Sewing Machine	8	6,750,000
Riveting Machine	2	13,500,000
Automated Multi-Function Sewing Machine	1	180,000,000
Automated Sewing Machine	2	94,500,000
Fabric Painting Machine	2	9,000,000
Gluing Machine	1	9,000,000
Total Machine Price per Line (in RP)		**589,500,000**

Current Financials

Below is the income statement of CV XYZ for the year 2021 with its current factory utilizing 5 production lines. Sales and cost of sales will be used for projection of future income statement and cash flows. The marketing expense is very low in the year 2021 as CV XYZ did not have to do any marketing activities as it already had order that could not be fulfilled. The cost of goods sold in the income statement given includes direct materials and direct labor. General and administrative expenses consist of indirect labor and depreciation. As for tax, as the operating income is higher than Rp 4,800,000,000, a tax of 22% of operating income is required to be paid.

Table 2. Income Statement for Year 2021

Income Statement for Year 2021 (in Rp)	
Sales	37,866,885,201

Cost of Goods Sold	29,939,193,989
Gross Profit	**7,927,691,212**
General and Administrative Expenses	2,399,269,221
Marketing Expense	35,000,000
Operating Income	**5,493,421,991**
Income Tax Expense (22%)	1,208,552,838
Net Income	**4,284,869,153**

Financial Projections

Financial projections that will be made is limited only to the results of the potential expansion of CV XYZ. This means that the projections only encompass the operations of the new factory. There will be further assumptions that will be made apart from those stated in the major assumptions. For the first year, even though the new factory will have the capacity of hosting 6 production lines, only 4 production lines will be utilized. The reason being that currently, CV XYZ has 20,000 units of unfulfillable orders, which can be fulfilled by using 4 production lines. This was done to create a conservative estimate in order to not overstate the potential profit of the expansion. For the second year up to the fifth year, the full 6 production lines will be utilized. However, depreciation will still follow the full machineries of 6 lines of production as all the machineries are included in the initial investments. This is done so CV XYZ will be ready in case of a sudden rise in demand.

Projected Income Statement

Sales and cost of goods sold will follow the data from year 2021, only scaled according to the production lines utilized. As such, for the first year, the sales and cost of goods sold will receive a 0.8 multiplier to account for only 4 production lines operating. From the second year onwards, the multiplier will rise to 1.2, assuming the factory is operating in full capacity. Both sales and cost of goods sold will also increase year over year to account for inflation with the rates as explained in the major assumptions section.

General and administrative expenses will only include extra marketing expenses and depreciation as there are no extra expenses to other areas. The addition in marketing expense is estimated to be Rp 700,000,000 for the first year and will be reduced to Rp 200,000,000 for subsequent years. The reason being that the marketing in the first year is required in order to get enough demand to operate in full capacity for the second year, hence why it is way higher.

On the other hand, depreciation is estimated to be Rp 353,700,000 per year for all 6 production lines as the machineries are depreciated using the straight-line method for their lifespans of 10 years.

Table 3. Projected Income Statement of New Factory

Projected Income Statement Limited to New Factory (in Rp)					
	Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Sales	30,293,508,161	46,349,067,486	47,276,048,836	48,221,569,812	49,186,001,209
Cost of Goods Sold	23,951,355,191	37,004,843,770	38,114,989,084	39,258,438,756	40,436,191,919
Gross Profit	**6,342,152,970**	**9,344,223,716**	**9,161,059,752**	**8,963,131,056**	**8,749,809,290**
Depreciation	353,700,000	353,700,000	353,700,000	353,700,000	353,700,000
Marketing Expense	700,000,000	200,000,000	200,000,000	200,000,000	200,000,000
Operating Income	**5,288,452,970**	**8,790,523,716**	**8,607,359,752**	**8,409,431,056**	**8,196,109,290**
Income Tax Expense	1,163,459,653	1,933,915,217	1,893,619,145	1,850,074,832	1,803,144,044
Net Income	**4,124,993,316**	**6,856,608,498**	**6,713,740,607**	**6,559,356,224**	**6,392,965,246**

Projected Operating Cash Flow

Projected Operating Cash Flow limited to New Factory (in RP)					
	Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Net Income	4,124,993,316	6,856,608,498	6,713,740,607	6,559,356,224	6,392,965,246
Depreciation	353,700,000	353,700,000	353,700,000	353,700,000	353,700,000
Net Cash from Operations	**4,478,693,316**	**7,210,308,498**	**7,067,440,607**	**6,913,056,224**	**6,746,665,246**

Table 4. Projected Operating Cash Flow of New Factory

Financial Analysis

There are several financial analysis methods that will be used in order to assess the profitability of this investment. The metrics that will be calculated are NPV, IRR, payback period, and profitability index. The year 0 will be added to the cash flows used in the analysis in order to represent the initial investments made to realize the expansion

Table 5. NPV Calculation

NPV Calculation (in Rp)		
Year	**Net Cash Flow**	**PV**
0	-16,518,758,197	-16,518,758,197
1	4,478,693,316	3,894,515,927
2	7,210,308,498	5,452,029,110
3	7,067,440,607	4,646,956,921
4	6,913,056,224	3,952,562,333
5	6,746,665,246	3,354,285,001
NPV		**4,781,591,095**

NPV Analysis

The net present value of the expansion of the new factory is estimated to be Rp 4,781,591,095 over 5 years of operation at a discount rate of 15%, as mentioned in the major assumptions. This can be considered a conservative estimate as in the first year of operation the new factory will only utilize 4 production lines. This net present value amount is a positive sign for the investment as this means that the investment is profitable by the investor's standard.

Table 6. IRR Calculation

IRR Calculation (in Rp)	
Year	**Net Cash Flow**
0	-16,518,758,197
1	4,478,693,316
2	7,210,308,498
3	7,067,440,607
4	6,913,056,224
5	6,746,665,246
IRR	**26%**

IRR Analysis

The calculation for internal rate of return shows that the investment has an expected IRR of 26%. This means that the investment will have an annualized return of 26% over the course of 5 years. As the predesignated discount rate amounts to 15%, it is safe to say that an IRR of 26% is desirable since it is higher than the discount rate.

Payback Period Analysis

The payback period calculation will be divided into two, undiscounted payback period and discounted payback period. The undiscounted payback period calculation uses the face value of the cash flows. On the other hand, the discounted payback period calculation uses the present value of the cash flows by discounting them with the discount rate. The undiscounted payback period amounts to 2.32 years while the discounted payback period is 3.36 years. This means that without discounting the future cash flows, the investments will be paid back in 2.32 years. If the future cash flows are discounted, the investments will be paid back in 3.36 years.

Table 7. Undiscounted Payback Period Calculation

Undiscounted Payback Period Calculation (in Rp)		
Year	**Net Cash Flow**	**Unrecovered Investment**
0	-16,518,758,197	16,518,758,197
1	4,478,693,316	12,040,064,881
2	7,210,308,498	4,829,756,383
3	7,067,440,607	-2,237,684,224
4	6,913,056,224	-9,150,740,448
5	6,746,665,246	-15,897,405,694
Undiscounted Payback Period		**2.32**

Table 8. Discounted Payback Period Calculation

Discounted Payback Period Calculation (in Rp)		
Year	**PV of Cash Flow**	**Unrecovered Investment**
0	-16,518,758,197	16,518,758,197
1	3,894,515,927	12,624,242,270
2	5,452,029,110	7,172,213,160
3	4,646,956,921	2,525,256,239
4	3,952,562,333	-1,427,306,094
5	3,354,285,001	-4,781,591,095

Discounted Payback Period	**3.36**

Profitability Index Analysis

The profitability index indicates how profitable the investment is relative to the initial investment. The results of the profitability index calculation shows that the project has a profitability index of 1.29. This means that after 5 years, the total present value of future cash flows would be 129% of the initial investment. As an investment with a profitability index of more than 1 is considered a profitable investment, the result of this calculation indicates that the expansion is profitable over the duration of 5 years.

The analysis of the four financial metrics shows if building the new factory is a feasible project. The NPV result of Rp 4,781,591,095 means that over the course of 5 years, the investment will earn this much present value of cash flow after the initial investment is subtracted, at a 15% discount rate. As the value is positive, this indicates that it is a sound investment. The IRR rate of 21% also shows that in order for the NPV to be zero, a discount rate of 21% must be applied. The 21% rate is 6% higher than the expected rate of 15%, which means that the investment will do better than the investor's expectation.

The payback period and the discounted payback period are 2.32 and 3.36 years respectively. Without taking into account the discount rate, the investment will be paid back in 2.32 years. When a discount rate of 15% is taken into account, 3.36 years will be necessary in order for the investment to be recovered. As building a new factory is a long-term investment, this level of payback period can be considered ideal. Finally, the profitability index is calculated to be 1.29. This means that the total present value of future cash flows in the next 5 years will be 129% higher than the initial investment.

Table 9. Profitability Index Calculation

Profitability Index Calculation (in RP)		
Year	**Net Cash Flow**	**PV**
1	4,478,693,316	3,894,515,927
2	7,210,308,498	5,452,029,110
3	7,067,440,607	4,646,956,921
4	6,913,056,224	3,952,562,333
5	6,746,665,246	3,354,285,001
Sum of PV of Future Cash Flows		21,300,349,292
Initial Investment		16,518,758,197

Profitability Index	**1.29**

This level of results is also affected by the preparation that has been made by CV XYZ and also several environmental factors. The company had planned for this expansion for quite some time and had prepared the necessary organizational and operational structures. This allows for a reduction in extra costs which increase the potential profit and income. Moreover, the current increase in demand while supply is lacking provide good support for the sales after expansion.

It should also be taken into account that all of the analysis made is based on the time period of 5 years. Building a new factory has a higher time horizon than 5 years and even the machineries lifespans are 10 years. This means that the investment will be way more profitable than what was calculated in this study. It can be inferred from this study that CV XYZ should build a new factory in order to expand its production capacity.

5. CONCLUSION

This feasibility study's purpose is to assess whether building a new factory will be profitable for CV XYZ. Without expanding its production capacity, it will not be able to grow any further as a business. Moreover, the current market seems to support this expansion attempt as demand is currently growing while the industry is experiencing supply issues. CV XYZ had also prepared the operational and organizational structure required for expansion, which provide further support for this project.

The analysis that was done using four metrics, which are NPV, IRR, payback period, and profitability index, indicated that the expansion should be implemented. The projections and the results of calculations can be considered conservative as it was assumed that the first year of operation will only see the new factory operating with four lines of production instead of the full six production lines. Moreover, the analysis is only done in a five-year time horizon when in reality, the investments in the form of new factory building and new machineries will last longer than five years. In conclusion, the results of this study shows that the implementation of this project is sound and will be profitable.

According to the results of this study, it is recommended for CV XYZ to build the new factory and expand its production capacity as soon as possible. The reason being, as stated in the SWOT analysis, that the current situation in the market favors the expansion and that CV XYZ is already sitting on top of 20,000 unfulfillable monthly order. The longer the implementation of this project is delayed, the more likely that this order will be shifted to

competitors. With how the current market is going, with the increase in production capacity orders should continue to increase as the industry is currently undersupplied.

However, the company should not utilize this new production capacity only to cater to current clients. This new capacity should be used to provide services to new clients in order to diversify its client base. It was established that at the current scale of CV XYZ, even after expansion, it will still be vulnerable to environmental factors. This will decrease the dependence that CV XYZ has on certain clients and mitigate the risk of being unable to collect on receivables. Another solution that can bring the same results would be for CV XYZ to start its own brand. Not only will this reduce the company's dependency of cash flow on its clients, it will also provide a possible future increase in profit margin.

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