Feasibility analysis of Rumah Tempe Zanada establishment in Bandung using net present value, internal rate of return, and payback period

F I Zativita\textsuperscript{1}, E Chumaidiyah\textsuperscript{1}

\textsuperscript{1} Industrial Engineering, Telkom University, JL Telekomunikasi 1 Bandung, Indonesia

Abstract. Rumah Tempe Indonesia was established based on the desire of KOPTI committee (Indonesian Tempe Tofu Producers Cooperative), Indonesian Tempe Forum, and Mercy Corps that want some changes in production process that can be used as references of ideal production place of tempe producer which prioritizes hygienic production process. As a pioneer of the establishment of a tempe hygienic production house, Rumah Tempe Indonesia opened its new business into Rumah Tempe Zanada which was established in Bandung. In establishing this business, a research study was conducted to ensure the is feasible. Using literature study and interview as the data collecting method, a feasibility study is conducted on the market, technical, and financial aspects of the establishment of Rumah Tempe Zanada for 5 years as the calculating period. The business is concluded to be feasible as in the financial aspect with the total of project cost at value Rp 765,427,036 by calculating the IRR which is 19\% using MARR is equal to 10.25\%, and estimated Payback Period from Tempe Zanada Home is 4 years, 6 months and 17 days. Meanwhile, the result of the NPV amount of this investment is Rp 260,380,763.

1. INTRODUCTIONS
Tempe is one of Indonesian traditional foods that mainly made of soybeans. According to Tempo News in 2014, Indonesia itself is the biggest tempe producer in the world and also the largest market of soybeans in Asia. In one of news article published in 2003 claimed that 50\% of soybeans production was used for tempe production, 40\% for tofu production, and the other 10\% was for other soybeans product such as soysauce, tauco and many more\textsuperscript{[1]}. The SUSENAS survey in 2014 that was released by Badan Pusat Statistik stated that the average of tempe consumption rate of each person in Indonesia reach 6.95 kg fr each year. The survey result of Badan Pusat Statistik also claimed that the average consumption rate of Tempe in Indonesia is relatively stable.

In West Java, one of many provinces in Indonesia, the soybeans production has repeatedly increased and even decreased because of the area availability\textsuperscript{[2]}. Based on another survey of Badan Pusat Statistik in West Java, the production of soybeans in 2015 reach 760 ton which increased about 558 ton or increased for almost 4 times from 2014. Other than that, according to the survey that has been done by Badan Ketahanan Pangan Daerah Provinsi Jawa Barat claimed that the availability of soybeans in West Java has lower amount than the consumption rate. This matter shows that the producer cannot supply the tempe demand in West Java.

Rumah Tempe Indonesia which is one of the biggest producer of Tempe in Indonesia, decided to open a new branch which is located in Bandung. West Java in order to fulfill the high consumption rate of Tempe in Indonesia. This new branch that is established in Bandung was named Rumah Tempe Zanada.
which is located in Jl. Kayu Lawang, Blok DD No. 7 Cibiru Hilir, Cileunyi, Bandung, West Java. To conduct an analysis of a better new branch establishment, proper planning is needed. According to Kamir and Jakfar, the feasibility can be used to avoid the risk of loss, and to monitor planning and control, and also to lighten the execution of work. From this feasibility study, it can be seen how the marketing prospect, technical aspect, and also the mathematical calculation of initial capital and income projection, so that the owner of Rumah Tempe Indonesia can know how the prospect of future business development. Thus, the result of this feasibility study can be a projected income and profit to be obtained by the business owner in accordance with the data provided. Later, this feasibility study can be considered in planning the development of a new expansion of Rumah Tempe Indonesia in the future.

2. METHODS
The conceptual model describes a system composed of conceptual compositions that can be used to help others to know, understand, or simulate the subject being described. The scope discussed in this chapter focuses on the establishment of a new branch of Rumah Tempe Indonesia called Rumah Tempe Zanada. In Figure 1 below it can be seen that feasibility analysis is done starting from the market aspect, then continued with technical aspect, and the result will be processed in financial aspect, and finally done sensitivity analysis.

![Research Conceptual Model](image.png)

**Figure 1.** Research Conceptual Model.

The initial stage of the systematic problem solving is the identification and preliminary stage. These activities can be done by conducting literature studies and preliminary field studies. The preliminary study is done to identify and formulate the problem to be researched and taken into the object of research.
In this case, the problem that became the object of research is the desire of the owner of Tempe House Indonesia who developed its business by opening a new expansion named Rumah Tempe Zanada. Therefore, a business feasibility analysis needs to be done so that the opening of a new company can produce an outcome in accordance with the wishes of the owner. This stage begins with identifying and formulating the problem, as well as determining the objectives and limitations of the problem. This is done so that research can be done in accordance with the required scope. These activities can be done by conducting literature studies and preliminary field studies.

The market aspect analysis explained about potential markets, available markets and target markets. It aims to determine the number of requests that must be met by the company because later generated figures determine the amount of production to be performed by the company. In the previous chapter, it has been discussed that the market aspect aims to know the amount of demand for products to be produced and position the product in a place that can generate profits. In the early stages of market aspect analysis, potential market analysis is conducted. The potential market itself is the maximum number of consumers in the market. Then, after getting the number of potential markets, a market analysis is available. Unlike the potential market, the available market is the number of consumers who have interest and purchasing power to the products offered by the company. After that, the target market analysis is an analysis of the consumers to be served by the company. The results of the analysis of the three components are an estimate of consumer demand for business products that will be used to perform production capacity analysis. If there is any sales history of the company, then the demand estimation can be obtained from the processed sales history.

After the analysis of production capacity produces figures showing how many products will be produced by the company, the figures will be processed in technical aspects consisting of analysis and planning of the company, needs of production area, facility needs and infrastructure, worker needs, and raw material needs directly. The results of the processing in these components will be how much the required investment cost and how much the operational costs (direct material costs, labor costs, overhead costs, and maintenance costs) will be incurred during the production process.

The result of this technical aspect will be processed as source data in the financial aspect in the form of income projection, profit and loss projection, cash flow projection, balance sheet projection, and feasibility study result of opening new company. Projected income represents how much revenue will be received by the company if all the products sold in the market run out by consumers. While the cash flow projection, is a report prepared with the purpose of knowing the changes in cash conditions that occur within a certain period.

After the feasibility study was obtained, sensitivity analysis was conducted to determine the effect that will be obtained by the company due to changes in the aspects that affect.

3. RESULT AND DISCUSSION

3.1. Market Demand and Demand Estimation

To obtain data that can be used in the process of analysis of market aspects, the authors interviewed employees and business owners to obtain sales data in Bandung in the previous year and month. This is done because, Rumah Tempe Indonesia which is the parent company of Rumah Tempe Zanada has sold product in Bandung area beforehand.

The calculation of demand forecast in the next period can be known after the data obtained from sales in the previous period. Forecasting will produce an estimate of demand that will be obtained by Tempe Zanada House in the next 5 years.
### Table 1. Sales History.

| Month            | KIZZ A | KIZZ B | Total Sales |
|------------------|--------|--------|-------------|
| September 2017   | 873    | 583    | 1,456       |
| October 2017     | 882    | 579    | 1,461       |
| November 2017    | 889    | 586    | 1,475       |
| December 2017    | 869    | 588    | 1,457       |
| January 2018     | 874    | 691    | 1,565       |
| February 2018    | 1,038  | 1,053  | 2,091       |

In the table above can be seen the amount of sales that have been fulfilled by Rumah Tempe Zanada on the period September 2017 to January 2018 with Kizz A as the product with 250 grams as the weight and Kizz B has 850 grams weight. After knowing the record of sales data in the previous period, the calculation of the increase or decrease in demand. With the presentation of the change in value, the result of forecasting demand with linear regression.

### Table 2. Demand Estimation.

| Year | Kizz A | Kizz B |
|------|--------|--------|
| 2018 | 12,874 | 14,688 |
| 2019 | 16,238 | 25,670 |
| 2020 | 19,616 | 36,730 |
| 2021 | 22,994 | 47,789 |
| 2022 | 26,372 | 58,848 |

### 3.2. Production Plan

Based on the machine capacity of 50 kg and the production history of Rumah Tempe Zanada, data obtained in the form of tempe production every year. In addition, calculations have been made regarding effective production time with 7 working days per week within 1 year so as to get the value of effective working time of approximately 365 days with 14 days off. As well as the wishes of business owners who add as much as 1% of the estimated demand for the amount of production each year, so it can be concluded the amount of production from Rumah Tempe Zanada as contained in the table below.

### Table 3. Production Plan.

| Year | Product Type | Annual Production (Unit) | Daily Production (Unit) | Daily Production (grams) |
|------|--------------|--------------------------|-------------------------|--------------------------|
| 2018 | KISS A       | 13,002                   | 38                      | 9,500                    |
|      | KISS B       | 14,835                   | 43                      | 36,550                   |
| 2019 | KISS A       | 16,401                   | 47                      | 11,750                   |
|      | KISS B       | 25,927                   | 74                      | 62,900                   |
| 2020 | KISS A       | 19,812                   | 57                      | 14,250                   |
|      | KISS B       | 37,097                   | 106                     | 90,100                   |
| 2021 | KISS A       | 23,224                   | 67                      | 16,750                   |
|      | KISS B       | 48,267                   | 138                     | 117,300                  |
| 2022 | KISS A       | 26,635                   | 76                      | 19,000                   |
|      | KISS B       | 59,436                   | 170                     | 144,500                  |
3.3. Initial Investment Cost
The initial investment cost can be determined after obtaining the amount of the required infrastructure and facilities based on the production plan with the production capacity of 100,000 grams. After the calculation, it can be concluded that the owner requires a fund of Rp 719,417,000 as the initial investment cost of business development.

Table 4. Initial Investment Cost.

| No | Item Name          | Unit Price | Requirement | Total Price |
|----|--------------------|------------|-------------|-------------|
| 1  | Washing Machine    | Rp 5,000,000 | 1           | Rp 5,000,000 |
| 2  | Boiling Machine    | Rp 5,000,000 | 1           | Rp 5,000,000 |
| 3  | Separating Table   | Rp 3,000,000 | 1           | Rp 3,000,000 |
| 4  | Packaging Table    | Rp 2,700,000 | 1           | Rp 2,700,000 |
| 5  | Fermentation Rack  | Rp 650,000   | 1           | Rp 650,000   |
| 6  | Plastic Sealer     | Rp 150,000   | 1           | Rp 150,000   |
| 7  | Weight Scaler      | Rp 450,000   | 1           | Rp 450,000   |
| 8  | Refrigerator       | Rp 1,250,000 | 1           | Rp 1,250,000 |
| 9  | Motorcycle         | Rp 15,255,000| 1           | Rp 15,255,000|
| 10 | Table              | Rp 300,000   | 2           | Rp 600,000   |
| 11 | Pen                | Rp 2,000     | 12          | Rp 24,000    |
| 12 | Ruler              | Rp 3,500     | 1           | Rp 3,500     |
| 13 | Scissors           | Rp 9,500     | 1           | Rp 9,500     |
| 14 | Telephone          | Rp 325,000   | 1           | Rp 325,000   |
| 15 | Building           | Rp 685,000,000| 1         | Rp 685,000,000|

Total Initial Investment Cost: Rp 719,417,000

3.4. Total Project Cost
Investment cost is the initial cost needed at the time of the establishment of Rumah Tempe Indonesia expansion. The cost of this investment includes the price of machineries, production equipment and factory administration to the building purchasing and transportation equipment owned by the company. Working Capital is the cost that a company needs to start its business early in the period. The calculation of working capital is done by dividing production and operational costs without depreciation in the first year by the number of months in the first year. In this case the company will consider the first 2 months as the working capital.

Table 5. Total Project Cost (TPC).

| Total Project Cost (TPC) 2018 | Total       |
|------------------------------|-------------|
| Fixed Investment             | Rp 719,417,000 |
| Working capital              | Rp 40,410,036  |
| Initiation (SIUP)            | Rp 5,000,000   |
| Product Brand                | Rp 600,000    |
| Total                        | Rp 765,427,036 |

Based on the calculation of total project cost, it can be seen that the amount of initial investment issued when establishing Tempe Zanada House amounted to Rp 765,427,036 which overall cost is spent by the Forum Tempe Indonesia.
3.5. Income and EAT Estimation
Estimated revenue or Income Estimation is a result of calculation of the estimated revenue generated from all sales activities undertaken by the company. Meanwhile, EAT (Earnings After Tax) is the income or net profit received by the company after deducting tax expense and other operational expenses.

![Rumah Tempe Zanada EAT Estimation](image)

Figure 2. Rumah Tempe Zanada Income and EAT Estimation.

Based on the graph above, it can be seen that the net profit earned by the company increases every year even though the company receive loss in the first year. In addition, the presentation of net income with income also increases with time. It can be concluded that the company can generate profits well.

3.6. Net Present Value
Based on the calculation of NPV from Net Cash Flow of Tempe Zanada House in the previous chapter, it is known that the company has a NPV value of Rp 260,380,763 which is positive in the 5th period. Because the value of NPV is positive, then business is declared viable using Net Present Value (NPV).

3.7. Internal Rate of Return
In addition to NPV, the Internal Rate of Return (IRR) is also a method used to assess the feasibility of the company. IRR compares the company's return on investment with the MARR (Minimum Attractive Rate of Return) which in this analysis uses the bank's appointed interest rate of 10.25% which is the interest rate of Bank Mandiri according to Bank Indonesia. Based on IRR calculation, it is known that Rumah Tempe Zanada has IRR value reaching 19%. Given this result, the conclusion of the feasibility analysis of Rumah Tempe Zanada is feasible. Because the IRR value of the business is worth 19% which means greater than the previously set MARR of 10.25% of Mandiri Bank Interest.

3.8. Payback Period
Based on the results of NPV that has been obtained before, it can be seen that the level of PBP Rumah Tempe Zanada is 4.6 which means 4 years 6 months and 17 days. Therefore, it can be concluded that the business of Rumah Tempe Zanada is considered feasible because the value of the calculation of PBP is lower than the number of research periods totaling 5 years.

3.9. Sensitivity Analysis
Sensitivity analysis is done to determine the level of corporate sensitivity to changes in input variables that affect it. This calculation and analysis is conducted so that business owners can anticipate the changes that may occur later so that this new branch can compete with competitors with changes in existing changes. In this study, the sensitivity analysis is done by changing the input parameters such as:
1. Decrease in total sales
2. Increase in operational cost
3. Raw material cost increase.
4. Increase in labor costs

| Input Parameters                  | Rate | NPV (Rp) | IRR  |
|----------------------------------|------|----------|------|
| Decrease in total sales          | 5%   | 81,547,473 | 15% |
|                                  | 9%   | 69,989   | 12% |
|                                  | 15%  | -137,025,594 | 7% |
| Increase in operational cost     | 5%   | 173,843,121 | 18% |
|                                  | 56%  | 344,722 | 12% |
|                                  | 100% | -147,839,463 | 7% |
| Increase in direct raw material cost | 5%  | 147,069,318 | 17% |
|                                  | 22%  | 235,819 | 12% |
|                                  | 50%  | -246,599,949 | 3% |
| Increase in direct labor cost    | 5%   | 170,702,320 | 18% |
|                                  | 48%  | 233,951 | 12% |
|                                  | 100% | -210,540,091 | 4% |

### 4. CONCLUSION

#### 4.1 Market Aspects

Based on the results of the analysis that has been done, it can be seen that the company has had a fixed income for sales tempe with weight 850 grams in some restaurants in Bandung, such as some outlets Warung Nasi Ampera and Sajian Sambara. While the market of Tempe Kizz weighing 250 grams is very diverse. This is because tempe kizz market their products through traditional markets and supermarkets. Because the demand increases through the year, the feasibility analysis of Rumah Tempe Zanada according to market aspects is concluded to be feasible.

#### 4.2 Technical Aspects

Based on the technical aspect, the establishment of Rumah Tempe Zanada can be said to be feasible because the production process is supported by the presence of facilities and infrastructures that fulfill the fulfillment of customer demand. Technically, Tempe Zanada House will need additional facilities and infrastructures as well as additional workers every year so that the production of tempe can run smoothly.

#### 4.3 Financial Aspects

Financial aspect research is done in the form of investment fund, revenue estimation, production and operational cost, profit and loss projection, balance sheet projection, and cash flow projection used to perform feasibility analysis using NPV, IRR, and Payback Period.

Based on the results obtained, it is known that the calculation results are as follows:

- **NPV**: Rp 260,380,763
- **IRR**: 19%
- **PBP**: 4 years 6 months 17 days

According to the result above, the NPV is more than 0 at the end of the research period and the IRR is 19% which is higher than the MARR which can be concluded that the company is feasible to run in terms of financial aspects.
4.4 Sensitivity Analysis
Based on the results of sensitivity analysis that has been done. It is concluded that a decrease in income of more than 9% can lead to infeasible investment value. In addition, the unfavorable value of investment can also be caused by an increase in operating costs by 56%. In addition, if direct material costs rise by more than 22%, the value of the firm's investment will be considered infeasible. And an increase of 48% direct labor cost causes the investment value to be infeasible.

5. REFERENCE
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