

**DETERMINING THE COMPANY'S PERFORMANCE AND MITIGATION  
ACTION OF AIR CONDITIONING SERVICES COMPANY  
DURING PANDEMIC**

**THESIS**

Submitted to International Program  
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By

**Nurfitria Handayani (17522096)**

**INTERNATIONAL UNDERGRADUATE PROGRAM  
DEPARTMENT OF INDUSTRIAL ENGINEERING  
UNIVERSITAS ISLAM INDONESIA  
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**2022**

## AUTHENTICITY STATEMENT

For the sake of Allah SWT, I admit this work is the result of my own work, except for the excerpts and summaries from which I have explained the source. If in the future it turns out that my confession is proven to be untrue and violates the legal regulations in the paper and intellectual property rights, then I am willing to get a diploma that I have received to be withdrawn by the Islamic University of Indonesia.

Yogyakarta, August 2022

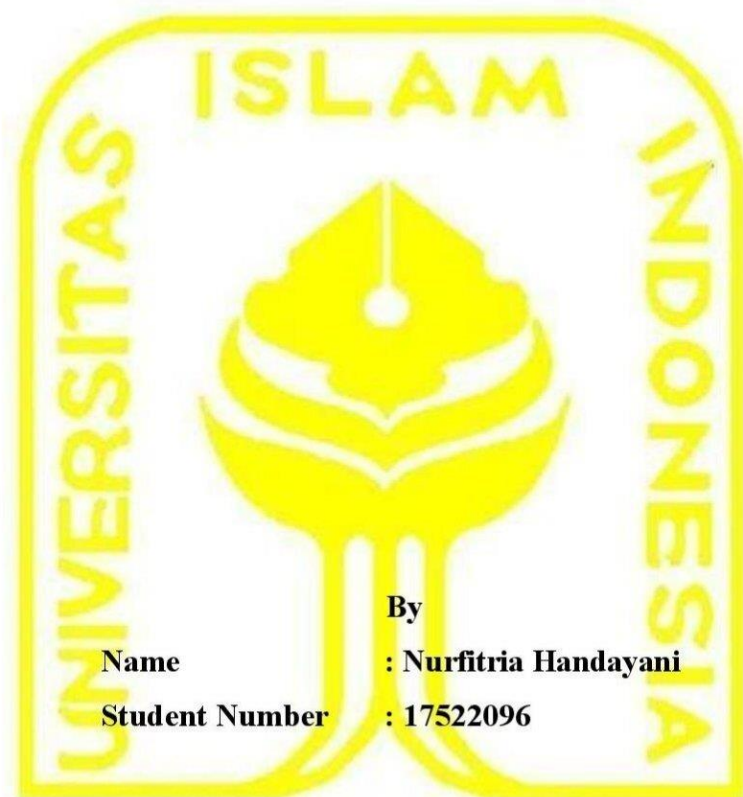


Nurfitria Handayani

**THESIS APPROVAL OF SUPERVISOR**

**DETERMINING THE COMPANY'S PERFORMANCE AND MITIGATION  
ACTION OF AIR CONDITIONING SERVICES COMPANY  
DURING PANDEMIC**

**UNDERGRADUATE THESIS**



**By**

**Name : Nurfitria Handayani**

**Student Number : 17522096**

**Yogyakarta, August 2022**

A handwritten signature in blue ink, appearing to read 'Muhammad Ridwan Andi Purnomo', is written over the bottom part of the UII logo.

**(Muhammad Ridwan Andi Purnomo, S.T., M.Sc., Ph. D.)**

**THESIS APPROVAL OF EXAMINATION COMMITTEE**

**DETERMINING THE COMPANY'S PERFORMANCE AND MITIGATION  
ACTION OF AIR CONDITIONING SERVICES COMPANY  
DURING PANDEMIC**

By

Name : Nurfitria Handayani

Student Number : 17 522 096

Had been defended in front of the Examination Committee in Partial Fulfillments of the requirements for the degree of Sarjana Teknik Industrial Engineering Department Faculty of Industrial Technology

Universitas Islam Indonesia

Examination Committee

Muhammad Ridwan Andi Purnomo, ST., M.Sc., Ph.D.

Examination Committee Chair

Dr. Drs. Imam Djati Widodo, M.Eng.Sc.

Member I

Bambang Suratno, S.T., M.T., Ph.D.

Member II

Acknowledged by,

Head of Study Program

International Undergraduate Program in Industrial Engineering

Universitas Islam Indonesia

Muhammad Ridwan Andi Purnomo, S.T., M.Sc., Ph.D.

## DEDICATION PAGE

This undergraduate thesis is dedicated to my father, Sukadi, S.T., my mother, Laila Choirul Mufidah, my brother, Deddy Wahyu Pratama, S.E., and my sisters, Afrilia Dwi Ramadhani, S.T. and Annisa Nazwa Rizky, who always gives me prays and supports during my study, and all of my friends, seniors, and juniors in International Program Industrial Engineering.



## MOTTO

*“You don't have to be great to start, but you have to start to be great” – Zig Ziglar*



## PREFACE

*Assalamu'alaikum Warahmatullahi Wabarakatuh*

*Al-hamdu lillahi rabbil 'alamin* and Gratitude are presented to Allah the Highest, Glory to Allah Unending, The Exalted, who granted me the health, inspiration, and ease all along to complete this thesis in acquiring the degree of Sarjana Teknik, entitled “Determining the Company’s Performance and Mitigation Action of Air Conditioning Services Company during Pandemic”. The assistance, guidance, support, and many helps, either directly or indirectly, from some parties involved. The author would like to thank:

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5. My family of Industrial Engineering International Program 2017.
6. All my partners in university, from IP FTI 2016, 2017, 2018, and 2019.
7. All C.I.S. (Community International Students) from batch 2015 – 2019 committee.
8. All parties who cannot be mentioned one by one for assistance in completing this Undergraduate Thesis.

The author realizes that there are still shortcomings as well as weaknesses in this report, so the suggestions and critics are fully expected. The author hopes this report will bring advantages for everyone who reads this.

*Waasalamu'alaikum Warahmatullahi Wabarakatuh*

Yogyakarta, August, 2022

(Nurfitria Handayani)

## ABSTRACT

*COVID-19 has affected Indonesia's economy and health. Government restrictions on work-from-home enterprises prevented them from operating normally. However, PT. FJL still creates a breakthrough or innovation to thrive in the pandemic situation. This research tries to determine the company's financial performance and the proposed solutions. This study uses multiple methodologies. First, calculate Net Profit Margin to determine the company's financial performance. Interview company experts to find the risk and cause to model using Causal Loop Diagram. The CLD output will generate a flow diagram for simulating the system to prove the impact of the suggested mitigation on the company. Decision Matrix Risk Assessment prioritized the listed risk (DMRA). Finally, customers were surveyed about the proposed product. The company suffered from a negative value of Net Profit Margin in January and April. The causal loop diagram displays revenue-affecting elements, while the risk mapping reveals four dangers with seven sources. According to risk mapping, competitors and the Covid19 pandemic should be solved first. This study proposes product diversification and additional products or services for the new normal period, such as fogging disinfection and UVC LED air conditioners. The simulation indicates that adding two products increases firm revenue. According to the survey, respondents are interested in the proposed products. UVC LEDs reportedly kill viruses and bacteria and fogging disinfectants that decrease fomite transfer on inaccessible surfaces. This research shows the suggested action's impact on firm performance.*

*Keywords: Financial Performance, Risk Analysis, System Dynamics, Product Diversification.*



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## CHAPTER I

### INTRODUCTION

#### 1.1 Background

A huge shift in businesses has been started because of Covid-19. In 2020, The World Health Organization classified the COVID-19 outbreak as a pandemic, which has significantly impacted people's lives, families, and communities. The economy has been impacted in both negative and positive ways. Tourism, trades, and industries are examples of covid-impacted businesses (Zaenuddin, 2021). However, the types of industries which can survive the pandemic are innovation-based businesses, basic-life needs businesses, and digital businesses. There are also types of industries, which developed during the pandemic, such as pharmacies, medicals, and technologies (Rosita, 2020). In order to assess the capability of a business to thrive, several measurement tools can be utilized and can be served as a business' future forecast.

One measurement tool for the sustainability of a business is the Net Profit Margin. Known as the summation of earnings, taxes, depreciation, and amortization, Net Profit Margin has been used for evaluating the business' profitability (Brigham & Houston, 2010). The NPM calculation is performed by many financial professionals to assess the capability of a company to generate cash. If the NPM value is negative, there are issues occurring in the company which affect its ability to generate cash, and the sustainability of the company is low, even more its profitability (Weston & Copeland, 1992).

To increase the profitability of a business, many ways can be performed. One of them is product diversification. The urge for product diversification can be critical to keep the business running and gain some profit while the other products or the main products do not perform well, as in the case of pandemic situations. Companies that were already well-diversified had an advantage in making the transition to COVID-19 conditions. Take, for example, Disney. When the company's theme parks throughout the world were forced to close, the company's income suffered a huge hit. Fortunately, Disney's Disney+ streaming platform had just recently started in November of 2019 (Rossum, 2021). This source of money supported the firm since it arrived at the ideal time to entertain families who were on lockdown and in need of new material to keep everyone entertained.

As a company, which has operated for many years, PT. Fath Jaya Lestari was also impacted by the pandemic. PT. FJL is a specialist HVAC contractor, which has been

running for over 20 years of time. PT. FJL is trusted by PT Berca Carrier Indonesia (The Sole Agent of Carrier and Toshiba in Indonesia) to become the main dealer in East Kalimantan, and trusted by PT Daikin Air conditioning Indonesia (The Sole Agent of Daikin in Indonesia) to become the authorized dealer in Kalimantan Timur.

Therefore, with that plenty of experiences, PT. FJL still creates a breakthrough or innovation to thrive in the pandemic situation. The problem aroused when there were some customers who cancelled the project with this company. Because of this, the company's performance during the pandemic has decreased. However, with this pandemic, the company might see it as opportunity to upgrade their product or services. This study focused on solving the problem by utilizing the product diversification approach and its impact on the company.

The strategy that can be taken by the company is to strengthen the existing market with product diversification in which the company offers additional products that can complement its existing products. The product is the addition of UV-C LED., which is claimed that UVC radiation has effectively been used to reduce the spread of bacteria and also viruses, where the air conditioner will work like an air purifier. In addition, there is a fogging disinfection service to reduce fomite transmission on the surface of objects, especially those that are not accessible.

## **1.2 Problem Formulation**

According to the research background, the formulated problem is how is the financial performance of the company during the pandemic and what strategy should be employed to overcome the problem during the pandemic.

## **1.3 Research Objective**

According to problem formulation, this research's objectives are to know the company's financial performance and the strategy that should be used to solve the problem in the pandemic.

## **1.4 Research Limitation**

The limitations of this research are as follows:

1. This research was conducted in 2021 at PT. FJL
2. The data was collected during the pandemic.
3. This research uses Net Profit Margin, system dynamic simulation, and DMRA method as an instrument for processing the data.
4. The information obtained is both primary and secondary data given by the firm and persons associated with the company.

### **1.5 Research Benefit**

By doing this research, the expected benefits of this research are as follows:

#### **A. Benefit for students**

1. Increase the knowledge to determine strategic planning with product diversification.

#### **B. Benefits for company**

1. The results of this study are intended to be useful to the company.
2. The company got the solution to solve the problem.



## CHAPTER II

### LITERATURE REVIEW

This chapter will explain the literature review studies and be divided into preliminary study and Fundamental theory. A preliminary study is from previous research that already has a reputation. Besides, the fundamental theory is a study that explains the basic idea related to research conducted in the textbooks. A preliminary and fundamental study needs to be done to find out the gap between the previous study and the research that would be conducted and also to be done to avoid plagiarism. This literature review will be divided into several subchapters.

#### 2.1 Preliminary Study

Several studies use Net Profit Margin calculation to measure financial performance. The research was done by Jian Xu, and Feng Liu (2020) conducted research in the Chinese manufacturing industry. This study aims to investigate the impact of IC on financial performance for manufacturing listed companies in the Chinese context. Financial performance is measured from two distinct aspects: (1) firm profitability, measured through earnings before interest, taxes, depreciation, and amortization (EBITDA), net profit margin (NPM), and gross profit margin (GPM), and (2) corporate return, measured through return on investment (ROI), return on assets (ROA), and return on equity (ROE).

Harahap et al. (2021) conducted a study with the aim of knowing and explaining the extent to which the performance of PT. Eastparc Hotel, Tbk. Was it affected by the emergence of the Covid-19 pandemic in the early days so that the problems encountered and how to overcome them could be identified. To measure the performance of PT. Eastparc Hotel, Tbk, used financial ratios consisting of financial liquidity ratios, financial solvency ratios, financial activity ratios and profitability financial ratios. The results of the analysis carried out are: (1) in the early period of the covid-19 pandemic, the company's financial condition was in good condition when viewed from the liquidity ratio and solvency ratio; (2) while in the early period of the covid-19 pandemic, the company's financial condition was in bad condition when viewed from the activity ratio and profitability ratio.

This paper investigates the COVID-19 outbreak, explains the policies adopted by governments, and examines the side effects of social distancing on the global economy

and international finance. Causal loop diagrams explain the interlinkages amongst the important variables and show that the outbreak follows the pattern of a reinforcing loop. Governments strive to balance this loop by adopting a set of policies, of which social distancing has left a tremendous negative impact on the global economy. The side effects of this policy are highlighted in three categories: short-term, midterm, and long-term, by explaining the reinforcing loops that require time to get stimulated. This paper anticipates some changes in future business caused by the pandemic, which can bring insights for managers. (Xu & Liu, 2021)

The research used a quantitative approach model containing complexion factors was proposed as a solution to overcome this problem. Based on this model, the simulation of the solution is made using the dynamic system principle, which is the causal loop diagram approach and Powersim software. Research about maintenance systems that holds an essential role in a company's establishment. A less optimal maintenance system will cause disturbance to the production process. Of the three scenarios which have been proposed, the third scenario is most optimal, that is suppressing maintenance cost fraction to 5 % value, increasing the preventive maintenance (PM - 10) fraction value, and decreasing value fraction of reactive maintenance (RM - 0.8) (Subiantoro, 2010).

This paper addresses how system grams and causal loop diagrams (CLD) can be used for communicating holistic and common system models to different segments of an organization. These models have been found useful to make sure all the involved parts have the same understanding of the project and follow how the initiation of a new project will propagate in respect of four aspects: technology, organization, business, and finance. It further describes how the mapped propagation can be used as a basis for risk assessment, where the risk is defined as the product of impact and probability. The method described in this paper provides a new and more lucid approach to risk assessment based on what the project wants to achieve. (Vinghøg et al., 2010)

Research by Firdayani (2018) with the title Modelling Chicken Egg Production System at PT. Sources Urip Agrisatwa Jember Regency obtained results. The research activity was carried out from November 2017 to January 2018. This research is a descriptive study that aims to describe the egg production system of broilers by describing, recording, analysing and interpreting the conditions that occur in the system. The method used in this study is the expert system method, which is a problem-solving method carried out by conducting

interviews with two experts in the field of laying hens. Then the results are modeled using the Powersim constructor version 2.51 software. The results of this study are (a) the model of the broiler egg production system consists of several subsystems, namely chicken population, egg production, costs, income and profits, population and market share, and (b) based on the results of the application of optimistic scenarios and pessimistic scenarios, occurs changes to the production of broiler eggs, namely in the application of the optimistic scenario, the egg production of broilers has increased from the current condition (moderate conditions), while in the pessimistic scenario, the egg production of broilers has decreased from the moderate conditions.

Fahreza conducted the research under the Dynamic System Modelling of Tofu Production at UD. The Jaya, Tamanan Subdistrict, Bondowoso Regency, got the following results: Factors that can simultaneously form the tofu production system of UD. Toha Jaya, Kalianyar Village, Tamanan District, Bondowoso Regency, is the raw material subsystem, processing subsystem, and tofu sales subsystem. Based on the research results, in applying the moderate scenario, the optimistic scenario, and the pessimistic scenario, the sale of tofu UD. Toha Jaya, Tamanan Village, Tamanan District, and Bondowoso Regency, continue to increase every month, except for the pessimistic scenario where the total cost and sales of tofu have decreased (Fahreza, 2018)

Based on Wardhana (2018) research, the title Dynamic System Modeling of Suwar Suwir Production at UD Rama, Jember Regency. The following results were obtained: The system modeling design that can represent the real system in the Suwar-suwir Production section at UD Rama, Kaliwates District, Jember Regency, can be

designed with four factors that strongly influence the main raw material subsystem, production subsystem, complete production business income subsystem, and profit subsystem.

*Table 2.1 Literature Review*

| No. | Author             | Year | Financial Performance Measurement |     |     |     |     |
|-----|--------------------|------|-----------------------------------|-----|-----|-----|-----|
|     |                    |      | EBITDA                            | NPM | GPM | ROA | ROI |
| 1   | Xu & Liu           | 2021 | v                                 | v   | v   | v   | v   |
| 2   | Mukhambetov et al. | 2020 | v                                 |     |     |     |     |

| No. | Author              | Year | Financial Performance Measurement |     |     |     |     |
|-----|---------------------|------|-----------------------------------|-----|-----|-----|-----|
|     |                     |      | EBITDA                            | NPM | GPM | ROA | ROI |
| 3   | Adamu et al.        | 2011 |                                   | v   |     |     |     |
| 4   | Oladimeji & Udosen  | 2019 |                                   |     |     | v   | v   |
| 5   | Nigam & Gupta       | 2021 |                                   |     |     | v   |     |
| 6   | Mehmood et al.,     | 2019 |                                   |     |     | v   |     |
| 7   | Oktariyani          | 2019 | v                                 |     |     |     | v   |
| 8   | Roslita & Vera      | 2019 |                                   |     |     | v   |     |
| 9   | Dong & Vogel-Heuser | 2021 | v                                 |     |     |     |     |
| 10  | Harahap et al.      | 2021 |                                   | v   | v   |     | v   |

| No. | Author                          | Year | Risk           |          | Risk Evaluation |     |      |       |  |
|-----|---------------------------------|------|----------------|----------|-----------------|-----|------|-------|--|
|     |                                 |      | Identification |          |                 |     |      |       |  |
|     |                                 |      | CLD            | Fishbone | DMRA            | HOR | FMEA | Other |  |
| 1   | Xu & Liu                        | 2021 | v              |          |                 |     |      |       |  |
| 2   | Subiantoro                      | 2010 | v              |          |                 |     |      |       |  |
| 3   | Lokobal et al.                  | 2014 |                |          |                 |     |      |       |  |
| 4   | Vinghøg et al.                  | 2010 | v              |          |                 |     |      |       |  |
| 5   | Marhavidas et al.               | 2011 |                |          | v               |     |      |       |  |
| 6   | Rizal                           | 2020 |                |          |                 |     | v    |       |  |
| 7   | Nikmah                          | 2015 |                |          |                 | v   | v    |       |  |
| 8   | Domínguez et al.                | 2019 |                |          | v               |     |      |       |  |
| 9   | Nealon et al.                   | 2022 |                |          |                 |     | v    |       |  |
| 10  | Puspita Sari et al.             | 2010 |                |          | v               | v   |      |       |  |
| 11  | Marhavidas et al.               | 2019 |                |          | v               |     |      | v     |  |
| 12  | Rono Kusumo & Silvanita Mangani | 2021 |                |          | v               |     |      |       |  |
| 13  | Andriani Rahayu                 | 2018 |                |          | v               |     |      | v     |  |
| 14  | Pirogova et al.                 | 2021 |                | v        | v               |     |      |       |  |
| 15  | Chin et al.                     | 2018 |                | v        |                 |     | v    |       |  |
| 16  | Halem & Jame                    | 2021 |                |          |                 | v   |      |       |  |
| 17  | Malabay                         | 2008 | v              |          |                 |     |      |       |  |
| 18  | Widayati                        | 2016 |                |          |                 |     |      |       |  |

| No. | Author      | Year | Risk           |          | Risk Evaluation |     |      |       |
|-----|-------------|------|----------------|----------|-----------------|-----|------|-------|
|     |             |      | Identification |          | DMRA            | HOR | FMEA | Other |
|     |             |      | CLD            | Fishbone |                 |     |      |       |
| 19  | Dhaniya     | 2018 |                | v        | v               |     |      |       |
| 20  | Aini et al. | 2019 |                |          |                 | v   |      |       |

## 2.2 Fundamental Theory

### 2.2.1 Financial Performance Measurement using Net Profit Margin

Financial performance measurement is regarded as a better method to obtain a description of a company's overall financial condition. The analysis is beneficial as an internal analysis for the management of the company so that they may check the obtained financial achievement so that it can be used for the forthcoming company planning. Besides, it can be an internal analysis for the creditor and investor that they are able to establish the policy of credit and investment in a company. Weston & Copeland (1992) define financial ratio analysis as the one designed to evaluate a company's financial report. The analysis is purposed to collate a company's leverage to its asset and to compare the accrued interest to profits available for the expenses. (Brigham & Houston (2015) defines financial ratio analysis as an instrument to analyse the company's achievement, which represents its various financial indicator and relation showing company financial changes or company operational achievement in the past. It is either helpful to describe the operational pattern of the company as well as to describe the risk possibility and chances in an immediate company.

#### A. Net Profit Margin

Net Profit Margin is the ratio used to show the company's ability to generate net profits. According to Bastian & Suhardjono (2006), Net Profit Margin is the ratio between net profit and sales. The greater the NPM, the more productive the company's performance will be, thus increasing investor confidence to invest in the company. This ratio shows how large the percentage of net profit earned from each sale. This ratio interprets the level of company efficiency, namely the extent to which the company's ability to reduce its operational costs in a certain period. The greater this ratio, the better because the company's ability to earn profits through sales is quite high, and the company's ability to reduce costs is quite good.

### 2.2.2 System Dynamic with Causal Loop Diagram approach

Forrester (1961) presented System Dynamics modeling as an application of Systems Theory within the management science research area, which tries to provide a foundation for dealing with management challenges. The System Dynamics method explains harmful behaviour and how it arose. One of this approach's methodologies, Causal Loop Diagrams, assists practitioners in modeling the underlying structures of a system as feedback loops, i.e., causal interactions between the components (i.e., variables) involved. The circular connections and feedback in an issue may be conceptualized and constructed using CLD. The diagram comprises nodes that indicate factors and arrows that reflect their connections. Positive or negative linkages may result in two-loop behaviour, such as reinforcing or balancing loops. According to Haraldsson, System Theory may help people transfer knowledge across fields and forecast how an issue would behave. A loop dominance analysis may be used to calculate RBP on a CLD model to anticipate a factor's trend. According to the authors, the use of System Dynamics modelling has been broadened to explore difficulties in a variety of other domains, including population growth sustainability and global warming (Haraldsson, 2004)

This CLD model, although the form and approach are different from the input-output model, still refers to the concepts and characteristics of the system. Namely, a system consisting of many interrelated components that influence each other needs to be looked at as a whole, that the role of feedback, both internal and external, from a system is very important to note, and that the system is strongly influenced by its environment. The system will generate entropy (extinction). If there is no balance between its inputs and outputs, or it ignores the demands and influences of its environment, and so on.

Causal Loop Diagram (CLD) is an appropriate way to represent feedback and causal relationships of a particular problem situation without distinguishing the nature of the interrelated variables (Charles, 2003). Causal links indicated by arrows will connect the variables. In each causal link, there will be a link polarity, positive (+) or negative (-), to indicate how the dependent variable changes when the independent variable changes. Furthermore, important loops will be defined by a loop identifier that will indicate whether a loop is positive (reinforcing) or negative (balancing) feedback. (Sterman, 2000).

### A. Link Polarity

Link polarity describes the structure of a system, not the behaviour of the variables. It describes the probability of occurring, not the actual event. There are two reasons to explain this statement. First, a variable can have more than one input, for example, in a population, where the birth rate is influenced by two variables, namely the fractional birth rate and the size of the population. In this case, it cannot be said that an increase in the fractional birth rate will increase the birth rate. It is also necessary to know whether a population has increased or not. The second reason is the Causal Loop Diagram (CLD), which does not divide the variables into stock and flow (Sterman, 2000). Figure 2.2 shows the location of the polarity link, where an example is a relationship between birth variables and population.

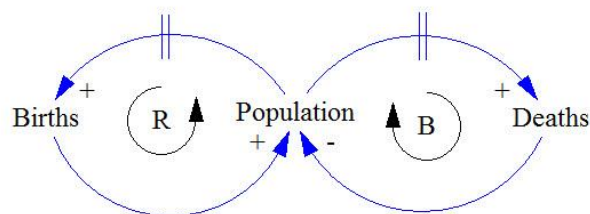


Figure 2.1 Polarity Link Example

Table 2.2 Type of Link

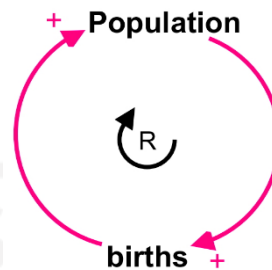
| Symbol                | Interpretation  | Example                            |
|-----------------------|---|------------------------------------|
| $X \xrightarrow{+} Y$ | If the value of X increases, then the value of Y will increase, and vice versa. | Birth $\xrightarrow{+}$ Population |
| $X \xrightarrow{-} Y$ | If the value of X increases, then the value of Y will decrease, and vice versa. | Death $\xrightarrow{-}$ Population |

### B. Loop Identifier

According to Sterman (2000), in CLD, there are two types of feedback loops as follows:

1. Reinforcing Feedback Loop

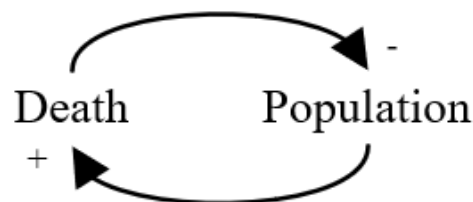
Reinforcing Feedback Loop is positive feedback. An example that can explain this statement is population, related to the birth rate per year. When the population increases, the birth rate will increase every year, so the population in the future will also increase. Figure 2.3 shows an example of a reinforcing feedback loop.



*Figure 2.2 Reinforcing Loop Example*

## 2. Balancing Feedback Loop

It is a feedback loop that will maintain the stability of a system. An example that can explain this is population, which is associated with mortality rates. When the population increases, the death rate will also increase, but increasing the death rate does not cause an increase in the population. Figure 2.4 shows an example of a balancing feedback loop.



*Figure 2.3 Balancing Loop Example*

The advantages of the system approach using this CLD model include:

- Encouraging us to see a problem as a whole, both in scope and time, prevents us from thinking narrowly and short-term.
- By describing the chain of cause-and-effect relationships in CLD, making our mental models more explicit, our basic beliefs about how the world works and the basis for how we make decisions and actions will be better.
- The existence of CLD allows our mental models to be known and compared with other people's mental models of the problems at hand to provide the basis for the realization of better teamwork. So CLD provides an effective tool for communication between team members.



- CLD will also be able to help explore policy alternatives and decisions so that the consequences can be anticipated earlier. It allows us to prevent making hasty decisions, which sometimes backfire, or making decisions that we will later regret.
- The overall systems approach using the CLD model allows us to be in the best position to make decisions that are tested from various possibilities and changes over time.

### 2.2.3 Risk Management

#### A. Risk

According to (Hanafi, 2006), a risk is an impact or consequence due to an ongoing process or future events. Risk can be interpreted as a state of uncertainty, where if an undesirable situation occurs, it can cause a loss. Risk is the potential for an event or occurrence, both predictable and unpredictable, to harm the achievement of the company's vision and mission. The risk is not in the plan of a project but has the possibility of events and causes project implementation time to be delayed, costs to expand, and compromises quality or performance. It can also occur in manufacturing companies where risks hamper and decrease company productivity. Meanwhile, in general, the risk is defined as a condition that can occur or arise due to uncertainty with all the unfavorable consequences. The Big Indonesian Dictionary (KBBI) is an unpleasant (harmful, harmful) result of an action or action.

According to Bramantyo (2008), the risk to the company can be categorized into four types, namely:

##### 1. Financial Risk

Financial risk is a fluctuation in a company's financial target or monetary size due to fluctuations in various macro variables. Its measures can be cash flow, company profits, and sales growth. It consists of liquidity risk, credit risk, and capital risk.

##### 2. Operational Risk

Operational risk is the potential deviation from expected results due to system malfunction, human resources, technology, or seven other factors. Operational risk can occur at two levels, namely technical and organizational. At the technical level, operational risk can occur if the information system, recording errors, inadequate information, and inaccurate and inadequate risk measurement. At the organizational level, operational risk can arise because the monitoring and reporting systems, systems and procedures, and policies do not work as they should. Operational risk consists of productivity, technology, innovation, system, and process risks.

### 3. Strategic Risk

Strategic risk can affect corporate exposure and strategic exposure due to strategic decisions that are not following the external and internal business environment. Strategic risk consists of strategic transaction risk, investor relations transaction, and business risk.

### 4. Externality Risk

Externality risk is the potential deviation of results in corporate and strategic exposures and can impact potential business closures due to the influence of external factors. Externality risk consists of reputation, environmental, social, and legal risks. In simple terms, *risk* can be defined as the probability of an adverse event occurring. There are three important elements of what is considered a risk:

- Event: A risk is an event
- Possibility: The incident is still a possibility where it may or may not happen.
- Disadvantage: If it happens, the impact will be a loss.

## B. Risk Management

Risk management is a structured and orderly process that systematically identifies, measures, maps, develops risk management, and monitors and controls the handling of the resulting risks (Bramantyo, 2008). Risk management is a broad approach to dealing with events resulting in negative and detrimental losses. Meanwhile, according to Dorfman (2004), risk management is a logical and structured process to understand the processes that can cause losses. Therefore, every organization requires implementing an integrated risk management system up to the implementation stage carried out by the organization. According to The Standards Australia/New Zealand (2004), there are four main procedures for conducting risk management, including

### 1. Problem Design

Problem design is the process of finding and evaluating the results of allegations about the impact of an event that has occurred or has not occurred from the impact caused by human activity. This stage is the initial stage of the environmental risk assessment.

### 2. Risk Analysis

The book The Standards Australia/New Zealand (AS/NZS 4360, 2004) explains that risk is a possibility of an unexpected event occurring that later the risk will affect a certain object. The risk can be measured from the consequences (consequences) and likelihood (probability) that arise from an event. The likelihood is the probability of a

period arising from an unspecified time. The calculation of likelihood used is frequency. The consequence is an event of a result. The result can be gain or loss.

At this stage, a risk assessment is carried out. The assessment in this study was carried out qualitatively through the distribution of questionnaires or structured interviews using a Likert scale and using expert judgment. Likert scale 1 to d. 5 to see the frequency and severity of the risk.

### 3. Risk Characteristics

Risk characteristics are the last step of a risk assessment. Determining the risk level can be identified by classifying the likelihood and consequences values into a risk matrix. After knowing the value of the two groups, a Risk Matrix can be obtained to find out how high the risk is.

An evaluation is carried out at this stage by looking at the existing risk mapping. The risk mapping can be categorized into four risk groups: low risk, moderate risk, high risk, and extreme risk. It is done to determine which of the four risks must be mitigated first

### 4. Risk Management

Risk management is the stage for companies to consider alternative strategies to minimize or reduce the possibility of a risk arising from these activities. This stage is known as the risk mitigation stage. Mitigation is an activity carried out to eliminate or reduce the possibility of unexpected events or reduce the consequences or consequences that include long-term risk reduction actions.

## CHAPTER III

### RESEARCH METHODOLOGY

#### 3.1 Research Subject

The subject of this research is PT. Fath Jaya Lestari (FJL) is located at Balikpapan, East Kalimantan. PT. FJL is concerned with HVAC (Heating, Ventilation, and Air Conditioner) systems, starting with installation, maintenance, and system design.

#### 3.2 Research Object

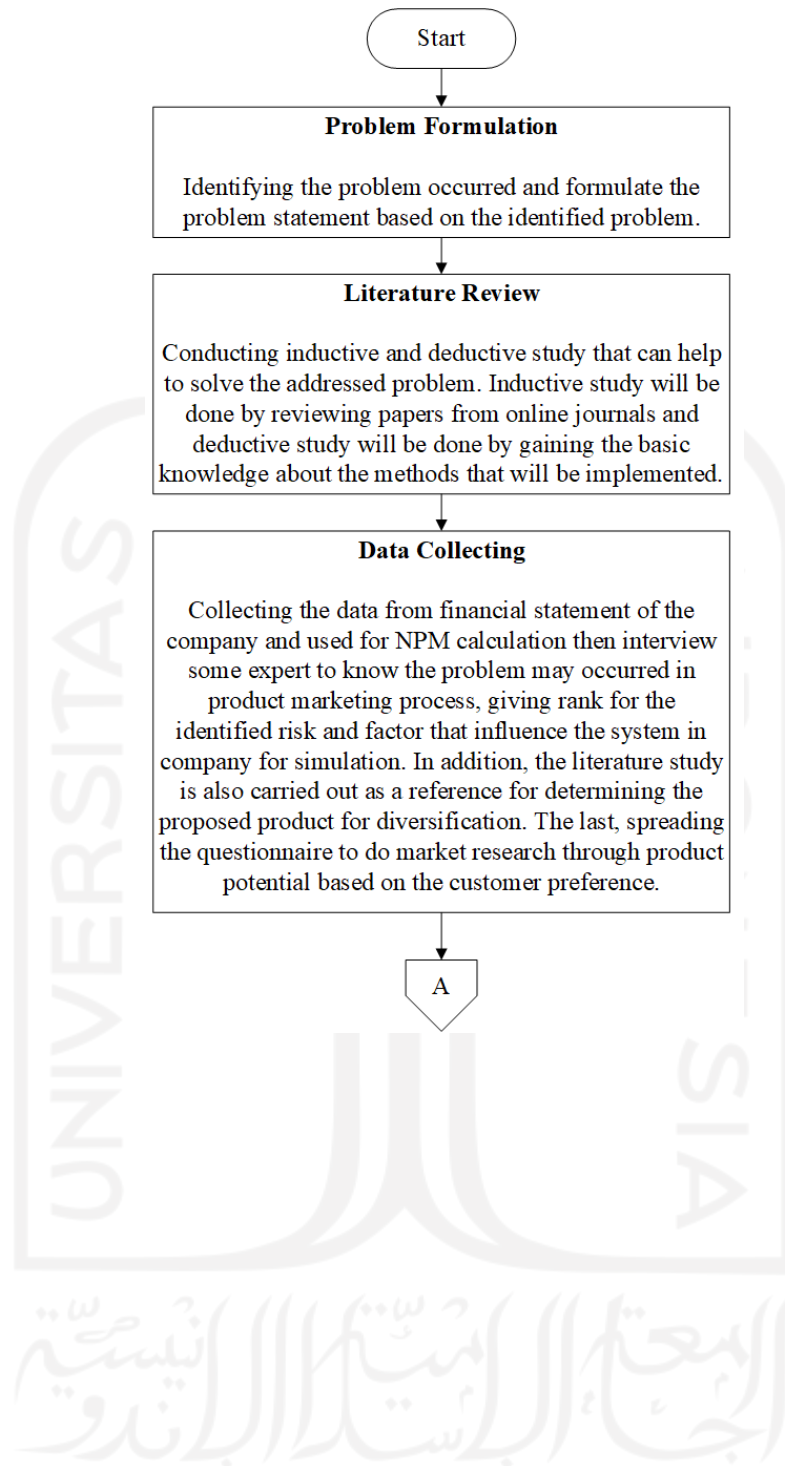
The object of this research is product diversification, which will be used as a strategy for the company. Since this company needs a plan to improve its performance, this research determines what products need to be added as product diversification.

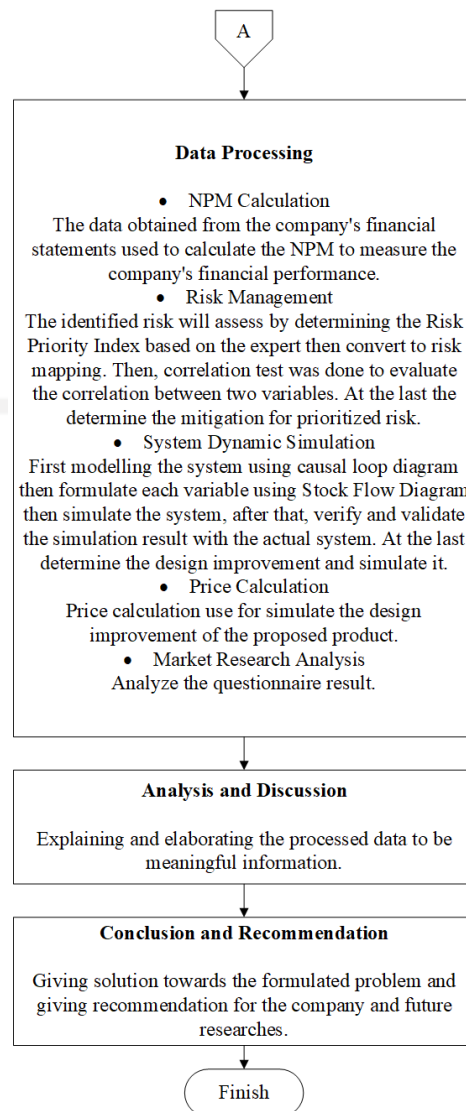
#### 3.3 Data Types

This research will use primary and secondary data to be processed. The data in this study were collected directly from the object of research and data obtained from the company's financial statements, research reports, and references related to indoor air quality.

#### 3.4 Research Flow

The research is accomplished by performing several steps. The steps are represented in the figure as follows:





*Figure 3.1 Research Flowchart*

### 1. Problem formulation

Problem formulation is an essential step in starting research. Problem formulation is obtained from identifying problems that occur in the research subject, which will determine the research objectives.

### 2. Literature review

The literature review contains references and theories needed to complete the research. In this study, there are two types of literature review, such as:

- The inductive study, this study contains several studies that are related to the research.
- The deductive study, this study contains references or guides of the method that will be used as the theoretical basis for this research.

### 3. Data Collection

In this step, the researcher will find the data used in this research. The data collected are based on the needs of NPM calculation, risk management, system dynamic simulation, and product determination.

a. Identification of problems that occurred related to the marketing process.

This information was obtained by interviewing the expert at PT. Fath Jaya Lestari. This data collection technique identifies what problems are experienced or what the company management wants to avoid in marketing its products.

b. Financial Statement

To calculate the company's financial performance using NPM calculation by obtaining financial data of the company.

c. Product determination

Literature studies from some journals, books, online portals, etc., are also used as references to determine the proposed solution for the problem and supporting references to accomplish this research.

d. Market Research

This information was gathered by spreading the questionnaire among some respondents who met the specified requirements.

### 4. Data Processing

a. NPM calculation

The net Profit Margin (NPM) calculation is used to define a company's performance. NPM will add the effects of the different capital structures and tax rates used by other companies and their depreciation and amortization. By including those expenses, the figure is honest in the company's ability to make a profit.

b. Risk assessment using Decision Matrix Risk Assessment

This method is used to evaluate the identified risk and determine the risk that should be prioritized and get the solution for it.

c. Correlation test using Pearson Method

The Pearson correlation test is used to determine the relationship between 2 or more variables. *Pearson correlation* is a measure used to measure the strength and direction of a linear relationship between two variables. Two variables are said to be correlated

if a change in one variable is accompanied by a change in the other, either in the same or opposite direction.

d. Creating a conceptual model of the system using Causal Loop Diagram approach

Through the causal loop diagram (CLD) model, all components or variables involved, both internal and external to the system concerned, are identified. The CLD model explains how the variables of a system are interrelated so that the authors can identify solutions that can be implemented in the future.

e. Price determination

The researcher uses a whole costing method to determine the price of goods sold. It shows the entire amount of overhead costs in great detail or comprehensively.

f. System Dynamic Model Simulation

This stage is creating a mathematical model or flow diagram from a CLD that was made previously using the help of dynamic system simulation software Powersim Studio 7. Changes and influences between variables in mathematical form or equations can be seen at this stage. System Dynamic in this research is used to determine the success of the proposed mitigation measures.

g. Model Verification and Validation

At the model verification stage, checking the model is carried out, whether the model created has reflected the conceptual model and is free from errors. Model verification is done to avoid the occurrence of logical errors that may occur. At the same time, the model validation aims to see whether the model already describes the actual conditions or not. The model is said to be valid when it does not have a significant difference from the actual system observed from its characteristics and behaviour.

h. Market Research

Market research is a strategic tool that helps to understand the feasibility of an idea and the level of demand in the market.

5. Analysis and Discussion

For the next step, the processed data is analysed, where an analysis will be carried out that aims to study the existing problems and draw conclusions from the current problems.

6. Conclusion and Recommendation

The author can answer the research problems that have been stated before.



## CHAPTER IV

### DATA COLLECTING AND PROCESSING

#### 4.1 Data Collecting

The data collection process consists of two parts. The first is collecting the company's financial statement for 2021 to identify the company's performance in a year. The second is risk identification by interviewing some experts in the company related to the existing risk and possible risks in the future.

##### 4.1.1 Financial Statement

The financial statement is used for calculating the value of the company's NPM in a year. This calculation has some variables, such as revenue, operational cost, interest, and tax. The recapitulation of those variables is shown as follows.

*Table 4.1 Financial Statement Data in 2021*

| Month     | Revenue           | Operational Cost  | Interest and Tax |
|-----------|-------------------|-------------------|------------------|
| January   | Rp 113,230,900.00 | Rp 116,659,344.00 | Rp 337,700.00    |
| February  | Rp 169,232,467.00 | Rp 142,128,817.00 | Rp 337,700.00    |
| March     | Rp 133,693,250.00 | Rp 121,193,220.00 | Rp 337,700.00    |
| April     | Rp 89,187,900.00  | Rp 90,881,432.00  | Rp 337,700.00    |
| May       | Rp 100,734,620.00 | Rp 94,140,632.00  | Rp 337,700.00    |
| June      | Rp 90,387,991.00  | Rp 83,918,681.00  | Rp 337,700.00    |
| July      | Rp 170,248,560.00 | Rp 136,189,350.00 | Rp 337,700.00    |
| August    | Rp 240,373,000.00 | Rp 165,010,510.00 | Rp 337,700.00    |
| September | Rp 236,412,500.00 | Rp 142,628,815.00 | Rp 337,700.00    |
| October   | Rp 302,631,610.00 | Rp 181,636,630.00 | Rp 337,700.00    |
| November  | Rp 539,913,794.00 | Rp 382,724,000.00 | Rp 337,700.00    |
| December  | Rp 779,548,400.00 | Rp 620,179,600.00 | Rp 337,700.00    |

#### 4.1.2 Risk Identification

Risk identification is carried out to determine the risks that occur in the company's activities that can potentially happen and affect the company's activities. The risks are identified based on the business process activity done by the company. Risk identification should be done by the company early in the project. Because the sooner the risks are identified, the sooner the manager or stakeholder will get a way to solve them, so the risk will not be greater. There are 4 risk events that were identified by the researcher. Following is a table identifying risk events that occurred at PT. Fath Jaya Lestari.

*Table 4.2 Identified Risk*

| <b>Risk Event</b>                 |
|-----------------------------------|
| Price War                         |
| Inability to reach target revenue |
| Weak economic growth              |
| Lack of brand awareness           |

The next stage is to identify the risk agent for each risk event. Identifying risk agents is done by interviewing experts, just like identifying risk events. The following is the risk agent for each risk event.

*Table 4.3 Identified Source of Risk*

| <b>Source of Risk</b>                | <b>Code</b> |
|--------------------------------------|-------------|
| Large number of competitors          | R1          |
| Buying decision decreasing           | R2          |
| Sales number decreasing              | R3          |
| Late payments                        | R4          |
| COVID19 pandemic                     | R5          |
| Limited promotion budget             | R6          |
| Lack of promotion tools and campaign | R7          |

## 4.2 Net Profit Margin Calculation

Net Profit Margin is a ratio that describes how much the company makes money. This profit margin is very important to pay attention to, both by large stable companies and small businesses. It is often used to measure the cash flow available for the needs of the company's financial obligations (Ross, Westerfield, and Jaffe, 2013). In the financial statements, NPM shows the company's profit after deducting interest on debt and taxes owed that must be paid. The following table shows the company's NPM value in 2021.

*Table 4.4 Result of NPM Calculation in 2021*

| <b>Month</b> | <b>Revenue</b> | <b>Operational Cost</b> | <b>Interest and Tax</b> | <b>NPM</b> |
|--------------|----------------|-------------------------|-------------------------|------------|
| January      | Rp 113,230,900 | Rp 116,659,344          | Rp 337,700              | -3%        |
| February     | Rp 169,232,467 | Rp 142,128,817          | Rp 337,700              | 16%        |
| March        | Rp 133,693,250 | Rp 121,193,220          | Rp 337,700              | 9%         |
| April        | Rp 89,187,900  | Rp 90,881,432           | Rp 337,700              | -2%        |
| May          | Rp 100,734,620 | Rp 94,140,632           | Rp 337,700              | 6%         |
| June         | Rp 90,387,991  | Rp 83,918,681           | Rp 337,700              | 7%         |
| July         | Rp 170,248,560 | Rp 136,189,350          | Rp 337,700              | 20%        |
| August       | Rp 240,373,000 | Rp 165,010,510          | Rp 337,700              | 31%        |
| September    | Rp 236,412,500 | Rp 142,628,815          | Rp 337,700              | 40%        |
| October      | Rp 302,631,610 | Rp 181,636,630          | Rp 337,700              | 40%        |
| November     | Rp 539,913,794 | Rp 382,724,000          | Rp 337,700              | 29%        |
| December     | Rp 779,548,400 | Rp 620,179,600          | Rp 337,700              | 20%        |

Table 4.3 contains the results of calculating the Net Profit Margin in 2021. The table consists of several variables used in calculating NPM, namely revenue, monthly operating costs, interest, and tax values.

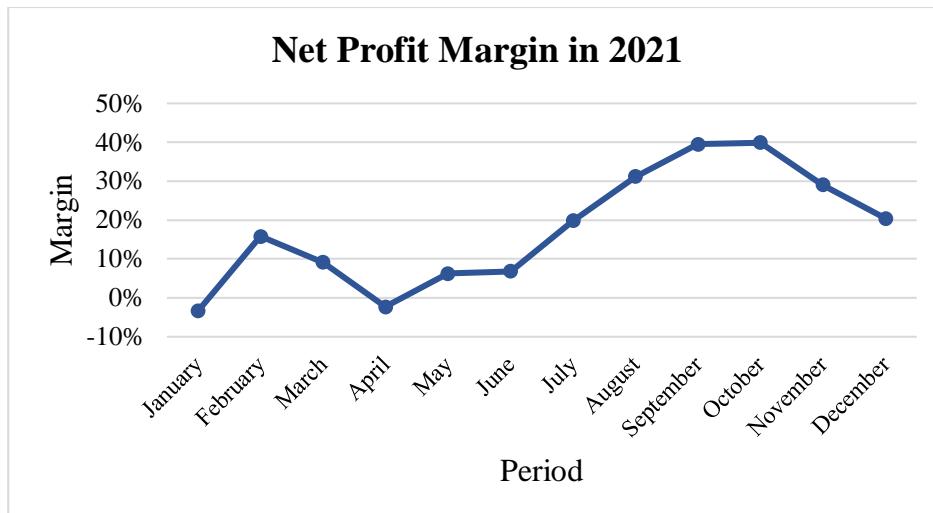


Figure 4.1 NPM Graphic in 2021

Figure 4.1 shows fluctuations in the Net Profit Margin in 2021 at PT. Fath Jaya Lestari. The lowest margin is in January 2021, while the highest margin is in September and October.

### 4.3 Marketing Risk Analysis

#### 4.3.1 Risk Priority Index Determination

The Risk Priority Index value is the multiplied result of the probability value and the severity value of each risk. The level of probability describes how many times the risk occurs. The severity level describes the impact of the risk on the company's performance. The value of the RPI illustrates how substantial the risk is to the sustainability of the project. The following is a table of RPI values for each risk:

Table 4.5 Risk Priority Index Table

| Source of Risk              | Code | Risk Evaluation |          |        |
|-----------------------------|------|-----------------|----------|--------|
|                             |      | Occurrence      | Severity | Rating |
| Large number of competitors | R1   | 5               | 4        | 20     |
| Buying decision decreasing  | R2   | 2               | 4        | 8      |
| Sales number decreasing     | R3   | 2               | 4        | 8      |
| Late payments               | R4   | 3               | 4        | 16     |
| COVID19 pandemic            | R5   | 5               | 5        | 25     |

|                                     |    |   |   |    |
|-------------------------------------|----|---|---|----|
| Limited promotion budget            | R6 | 3 | 5 | 15 |
| Lack of promotion tool and campaign | R7 | 3 | 5 | 15 |

### 4.3.2 Risk Map Matrix

At this stage, a risk evaluation is carried out, namely mapping the RPI value that has been obtained from risk analysis. Risk mapping maps risk events in 4 areas, namely red, orange, yellow, and green areas. The risk map is shown in Figure 4.5.

|          |               |             |          |          |        |                |
|----------|---------------|-------------|----------|----------|--------|----------------|
| Severity | Catastrophic  |             |          | R6,R7    |        | R5             |
|          | Major         |             | R2,R3    |          | R4     | R1             |
|          | Moderate      |             |          |          |        |                |
|          | Minor         |             |          |          |        |                |
|          | Insignificant |             |          |          |        |                |
|          |               | Rare        | Unlikely | Possible | Likely | Almost Certain |
|          |               | Probability |          |          |        |                |

Figure 4.2 Risk Mapping

The red areas will be processed to the next stage, namely the stage of formulating corrective action strategies to reduce risk. There are 2 risks in the red area, while in the orange area, there are 3 risks. The risk in the red area is a risk with an RPI value of 25 and 20. Meanwhile, the risk in the orange area is a risk with an RPI value of 15 and 16. For an RPI value below 10, it is included in the yellow and green areas, which are areas that are still considered safe.

### 4.3.3 Correlation Test using Pearson Correlation Method

After knowing which risk is very influential on the company's income based on interviews with several employees responsible for their respective fields, furthermore, to ensure the correlation between these two variables, a Correlation Test was also carried

out to ensure that these two variables correlated. The results of the correlation test can be seen in Figure 4.6:

**Correlations**

|         |                     | COVID19            | Revenue            |
|---------|---------------------|--------------------|--------------------|
| COVID19 | Pearson Correlation | 1                  | -.637 <sup>*</sup> |
|         | Sig. (2-tailed)     |                    | .026               |
|         | N                   | 12                 | 12                 |
| Revenue | Pearson Correlation | -.637 <sup>*</sup> | 1                  |
|         | Sig. (2-tailed)     | .026               |                    |
|         | N                   | 12                 | 12                 |

\*. Correlation is significant at the 0.05 level (2-tailed).

Figure 4.3 Pearson Correlation Test Result

Based on the table of Pearson correlation test results, it is known that the value of Sig. (2-tailed) between the variable covid-19 and revenue is 0.026, so the value of Sig. (2-tailed) < 0.05, means that there is a correlation between the two variables.

#### 4.4 Identification Risk Mitigation

Risk mitigation is a way to manage risks and reduce the consequences of risks and prioritize risk management follow-up with the highest total effectiveness and cost-efficient. The researcher compiled some proposed mitigations in the following table through the risk that is identified in the red zone.

Table 4.6 Proposed Mitigation Table

| <b>Risk Caused</b>            | <b>Prevention Action</b>   |
|-------------------------------|--|
| A large number of competitors | Product Diversification  |
| COVID19 pandemic              | Providing additional products or services for the new normal era |

#### 4.5 Product's Price Calculation

##### 4.5.1 Production Cost

Production costs are all the costs related to the production of goods or services. In this research, the production cost is divided into raw material and labor costs.

#### A. Raw Material

Raw materials used in the production process that are easily traced to the product are called direct materials (Heisinger, 2009). The tables below represent the details of raw materials used for UVC LED installation and fogging disinfection.

*Table 4.7 UVC LED Raw Material Cost*

| No.          | Description        | Qty | Unit | Price             |
|--------------|--------------------|-----|------|-------------------|
| 1            | UVC LED            | 100 | cm   | Rp 327.500        |
| 2            | Fiber cable 1.5 mm | 50  | cm   | Rp 7.500          |
| <b>Total</b> |                    |     |      | <b>Rp 335.000</b> |

*Table 4.8 Fogging Disinfectant Raw Material Cost*

| No.          | Description                 | Qty | Unit | Price            |
|--------------|-----------------------------|-----|------|------------------|
| 1            | HOCl solution               | 50  | ml   | Rp 13.000        |
| 2            | Disposable safety equipment | 1   | pcs  | Rp 15.000        |
| <b>Total</b> |                             |     |      | <b>Rp 28.000</b> |

#### B. Cost of labour

The cost of labor is the wages and salaries that employees receive. It can be divided into two categories: the cost of direct labor and the cost of indirect labor. The table below represents the labor cost that is used for uvc led and fogging disinfectants.

*Table 4.9 UVC LED Labour Cost*

| No | Type of Cost | Qty | Unit   | Price     |
|----|--------------|-----|--------|-----------|
| 1  | Technician   | 3   | person | Rp 75.000 |

*Table 4.10 Fogging Disinfectant Labour Cost*

| No | Type of Cost | Qty | Unit   | Price     |
|----|--------------|-----|--------|-----------|
| 1  | Technician   | 3   | person | Rp 45.000 |

#### 4.5.2 Cost of Service Determination

Your cost of goods sold, also known as cost of sales or cost of services, is how much it costs to produce your business's products or services. It is the sum of direct materials used and direct production labor used. The table below represents the calculation of the cost of goods manufactured per unit.

*Table 4.11 UVC LED Cost of Good Manufactured*

| No.          | Type of Cost      | Price             |
|--------------|-------------------|-------------------|
| 1            | Raw Material Cost | Rp 335.000        |
| 2            | Technician Cost   | Rp 75.000         |
| <b>Total</b> |                   | <b>Rp 410.000</b> |

*Table 4.12 Fogging Disinfectant Cost of Good Manufactured*

| No.          | Type of Cost      | Price            |
|--------------|-------------------|------------------|
| 1            | Raw Material Cost | Rp 28.000        |
| 2            | Technician Cost   | Rp 45.000        |
| <b>Total</b> |                   | <b>Rp 73.000</b> |

#### 4.5.3 Pricing

The price of a product defined by the method used for this case is the cost-plus pricing method, which defines the price per unit by calculating all of the production costs plus the margin to cover all of the capital. The formula of the Cost-plus Pricing Method is:

$$\begin{aligned} \text{Pricing} &= \text{Total Cost} + \text{Margin} \\ &= \text{Production cost} + (\text{Percentage profit} \times (\text{Production Cost})) \end{aligned}$$

Based on the formula, pricing can be determined. Thus, the result of the pricing is:



*Table 4.13 UVC LED Cost of Goods Sold*

| <b>Element</b>  | <b>Amount</b>       | <b>Cost</b> |
|-----------------|---------------------|-------------|
| Production Cost | Rp 410.000          | Rp 410.000  |
| Profit          | 40% Production Cost | Rp 164.000  |
| <b>Price</b>    |                     | Rp 574.000  |

*Table 4.14 Fogging Disinfectant Cost of Goods Sold*

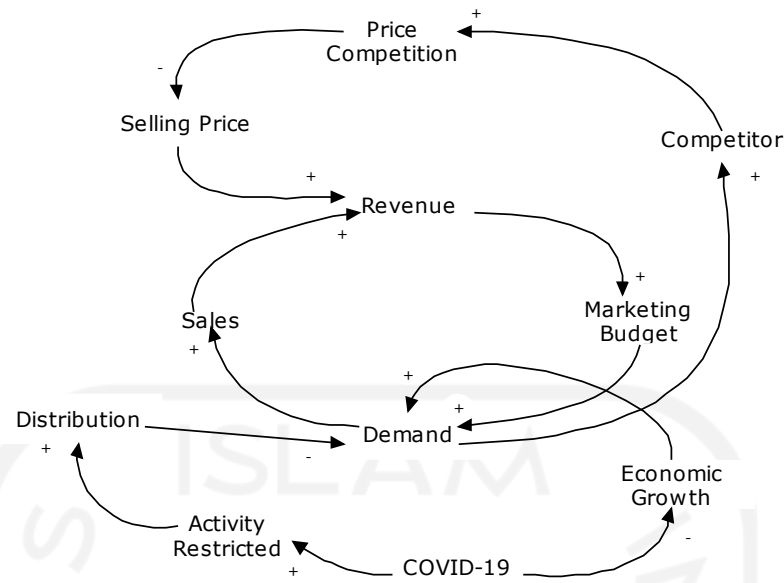
| <b>Element</b>       | <b>Amount</b>       | <b>Cost</b> |
|----------------------|---------------------|-------------|
| Production Cost      | Rp 73.000           | Rp 73.000   |
| Profit               | 50% Production Cost | Rp 36.500   |
| <b>Price</b>         |                     | Rp 109.500  |
| <b>Rounded Price</b> |                     | Rp 110.000  |

Based on the calculation, the selling price for UVC LED installation and fogging disinfectant (the maximum area is 50 m<sup>2</sup>) are Rp 574.000 and Rp 110.000

## **4.6 System Dynamics Simulation**

### **4.6.1 Causal Loop Diagram**

Causal loop diagram (CLD) modeling was used to understand the current situation and possible risk management situation in PT. Fath Jaya Lestari. This model helps to identify the things that might be the source of risk.



*Figure 4.4 Causal Loop Diagram*

Figure 4.2 shows a causal relationship that results from the weakening of economic growth in companies, increasing levels of business competition. In making a causal loop diagram, 11 variables can be found that affect the system.

#### 4.6.2 Stock Flow Diagram

The next stage after the causal loop diagram is making a flow diagram of a simulation model consisting of stock - flow. Stock or accumulation reflects the system's state and as a generator of information, where actions and decisions are based on it (Rohmatulloh, 2007). The stock model dynamic variables of quality risk assessment are identified in the following table.

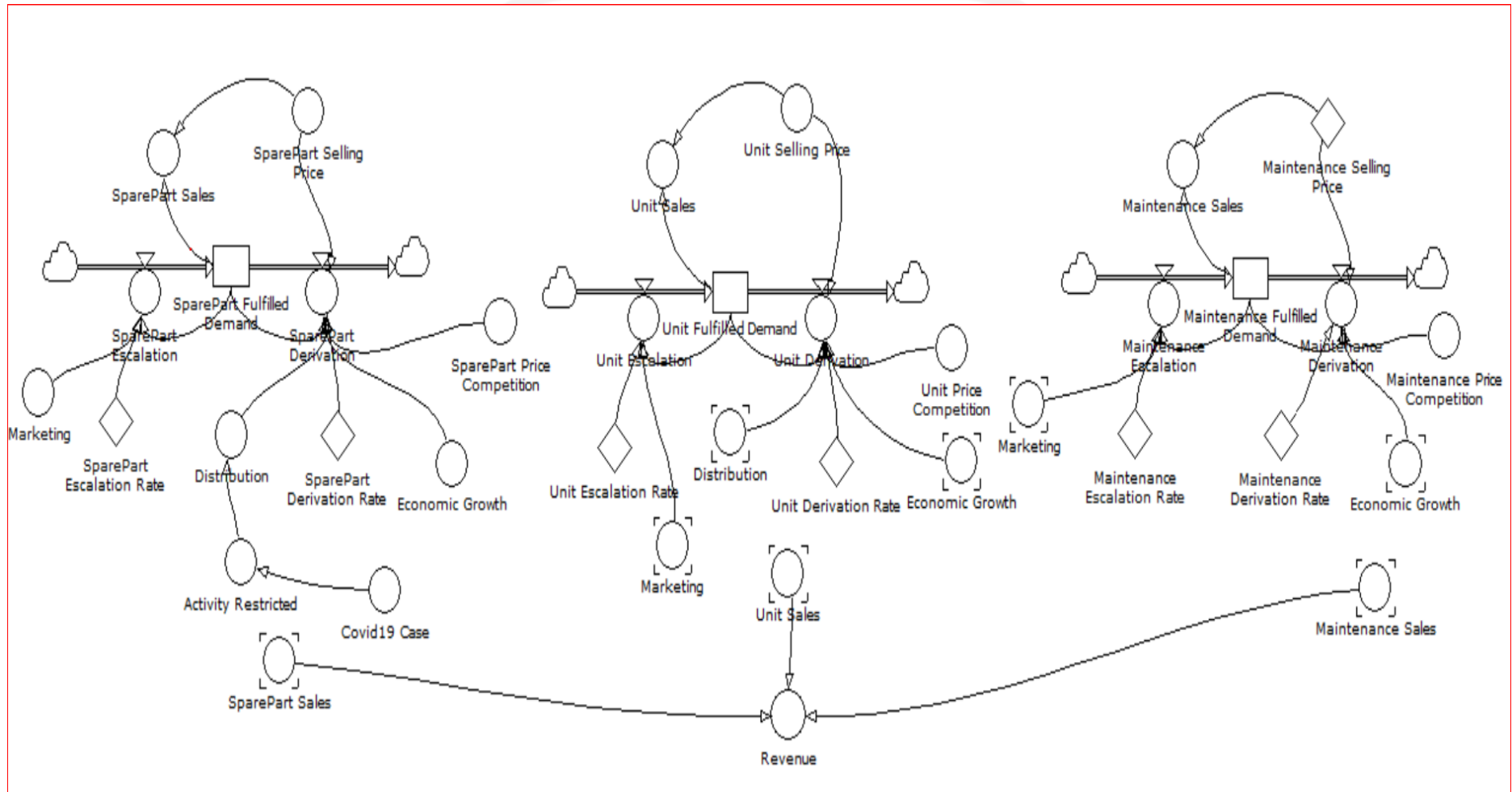


Figure 4.5 Stock Flow Diagram

### 4.6.3 Model Verification and Validation

#### A. Verification

The process of verifying the dynamic risk assessment model uses several methods. They are first checking the relationship between variables and parameters so that there is a logical consistency in the relationship. Suppose there is an illogical or incorrect relationship between variables or parameters. In that case, Powersim will provide a "#" symbol on the link that connects the variable so that the relationship can be corrected. Second, checking the unit of analysis of variables or parameters to be consistent. Powersim will give a sign "?" meaning that the equation is still inconsistent with the unit of analysis it uses. Third, check the behaviour of the dynamic model of quality risk assessment on the key variables. The dynamic risk assessment model has succeeded in carrying out a simulation process for studying an abstract world model following the natural world's behaviour. His pattern of behaviour is exponential growth. Thus, the computer program and its implementation are correct and have shown behaviour and responses following the model's objectives. The verification process of the dynamic risk assessment model has complied with the verification procedure referred to by Schlesinger et al. (1979) in Rohmatulloh (2007).

#### B. Validation

Validation is the step to prove whether the model that has been made is following the actual system or not. There are several model validation techniques. In this study, the researcher used statistical validity by comparing the number of entries from the simulation results to the system. The test used in the model validation is the equality of means test and equality of variance test. The equality of means test is intended to determine the performance comparison between the real system with simulation models, which translates into an average value of the amount of output from these two populations. If the test result is that the average value does not differ significantly, it can be concluded that the model has sufficient validity to the output parameters - average. Here are the validation steps:

Table 4.15 Data of Simulation Result and the Real System

| No | Output (Real) | Output (Simulation) |
|----|---------------|---------------------|
| 1  | 113230900     | 438266093           |
| 2  | 169232467     | 267304145           |
| 3  | 133693250     | 304486008           |
| 4  | 89187900      | 235774883           |
| 5  | 100734620     | 216970954           |
| 6  | 90387991      | 218522262           |
| 7  | 170248560     | 198685403           |
| 8  | 240373000     | 182230941           |
| 9  | 236412500     | 188650773           |
| 10 | 302631610     | 232846884           |
| 11 | 539913794     | 263357703           |
| 12 | 779548400     | 284823771           |

The following are the steps for the Equality of Means Test:

- Calculates the mean of both population and standard deviation.

Table 4.16 Mean and Standard Deviation Calculation Result

|             | Real      | Simulation  |
|-------------|-----------|-------------|
| <b>Mean</b> | 242978056 | 252659985   |
| <b>SD</b>   | 201658995 | 159796071.4 |
| <b>N</b>    | 12        | 12          |

- Determining Hypothesis:

H0: mean of simulation models = mean of the real system; There is no difference between historical data (actual) mean and simulated data mean.

H1: mean of simulation models  $\neq$  mean of real systems; There is a difference between historical data (actual) mean and simulated data mean.

- Level of Significance:

Table 4.17 Significance Level

| $\alpha$ | $(\alpha/2)$ |
|----------|--------------|
| 0,05     | 0,025        |

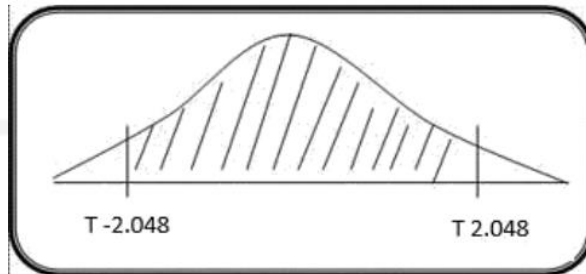


Figure 4.6 Graph for Acceptance of Equality of Mean Test

H0 isn't reject if  $-t 0.025 < t < t 0.025$

H0 reject if  $t \text{ value} < -t 0.025$  or  $t \text{ value} > t 0.025$

- Statistical Test

Determine the value of  $Sp^2$  first, assuming the variance of the two populations is the same, using the formula:

$$Sp^2 = \frac{(n_1 - 1)v_1^2 + (n_2 - 1)v_2^2}{n_1 + n_2 - 2}$$

The value of  $Sp^2$  is 60684373349375400. Then proceed with calculating T value with the formula:

$$T_{value} = \frac{Mean_1 - Mean_2}{\sqrt{Sp^2 \times \left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

Based on the results of the calculation of T value, the resulting value is  $= -0.96$ .

- Statistical Decision

From the calculations that have been done, it is known that the value is  $-2,048 < T \text{ value} < +2,048$ . So, it means that H0 is accepted or there is no difference in average between historical data (actual) and data from simulation results. So, it can be concluded that the result of the simulation and the real system are equal.

## 4.7 Market Research

### 4.7.1 Sufficient Data Test

A sufficient data test is conducted to determine the extent to which the existing data can represent several samples from the population. In this study, the number of questionnaires distributed to customers was 30. The formula used to test the adequacy of the data by Wiratna Sujarweni (2014), namely Slovin's Formula, which show in the calculation below:

$$n = \frac{N}{1 + Ne^2}$$

Description:

N : Number of questionnaires

e : Expected error

Then the calculations are carried out as follows.

$$n = \frac{30}{1 + (30 * 0.05^2)}$$

$$n = 28 \text{ data}$$

Therefore, the data required is 28 data. It can be seen in the calculations that have been carried out that the value of n obtained is not greater than the value of N. It can be concluded that the data is considered sufficient because if  $n \leq N$  (the number of theoretical observations is less than or equal to the actual observations made), then the data is declared to have sufficient for the desired error rate.

### 4.7.2 Market Research Analysis

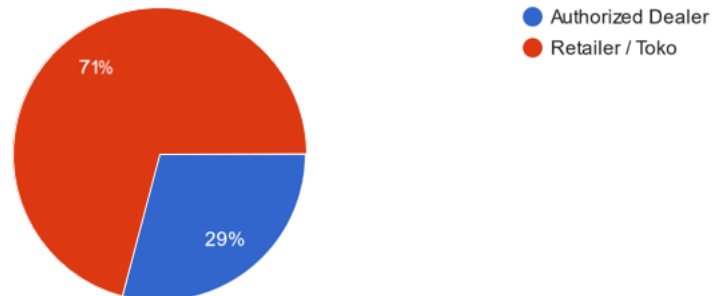
#### A. Pre-Survey

The data is collected by spreading the online questionnaire given to people who use air conditioners daily. The questionnaire was created using Google Forms, and it spread via Whatsapp. The primary purpose of this questionnaire is to know the potential of the

suggested product in the market. Thirty-one respondents answered the questionnaire. These are the summaries of the form:

Dimanakah anda membeli AC?

31 responses

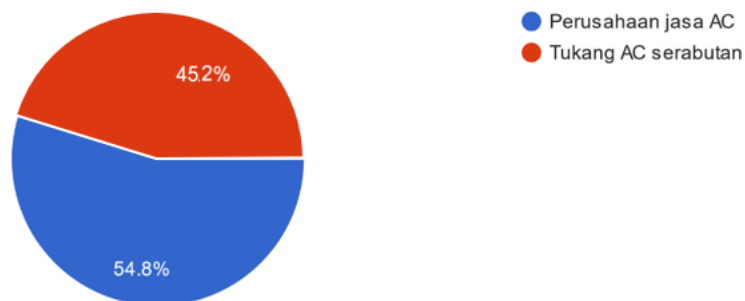


*Figure 4.7 Source of Product Chart*

Chart shows where the respondents bought their air conditioner. From the chart, most of the respondents bought from the electronic retailer, which is 71% of 31 respondents. The rest, 29%, was bought from an authorized air conditioner dealer.

Dengan siapa anda melakukan perawatan AC anda?

31 responses

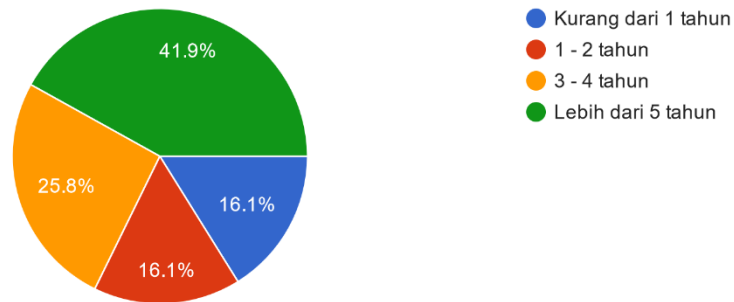


*Figure 4.8 Maintenance Services Chart*

The chart shows the respondents' preferences in choosing AC maintenance services. From the graph, more than half of the respondents chose an ac service company, 54.8% of them, to maintain their air conditioner. At the same time, the remaining 45% choose ac service maintenance from an ac repairer.



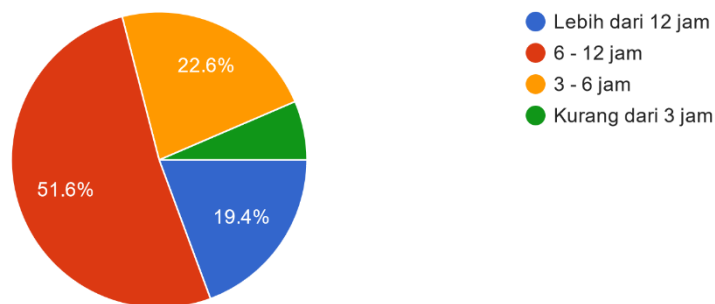
Sudah berapa lama anda menggunakan jasa perawatan AC?  
31 responses



*Figure 4.9 Air Conditioner Maintenance Service Usage Time*

This chart shows how long the respondents have used the ac and trust the ac treatment with a third party. Most of the respondents were users of ac and ac maintenance services for more than two years, which is 25.8% of the respondents had used it for around 3-4 years, and 41.9% are more than five years.

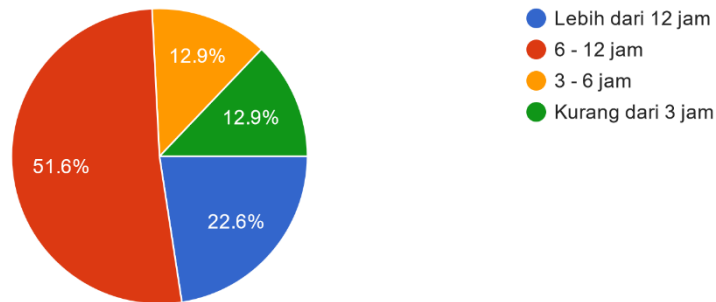
Dalam sehari, berapa lama anda menggunakan AC?  
31 responses



*Figure 4.10 AC Maintenance Usage Time*

The chart represents the range of duration of ac use in a day. The highest percentage is from the respondent who uses air conditioner around 6-12 hours a day with 51.6%. Then the other 19.4% use an air conditioner more than 12 hours a day, 22.6% of respondents use it for around 3-6 hours a day, and the rest use it for less than 3 hours.

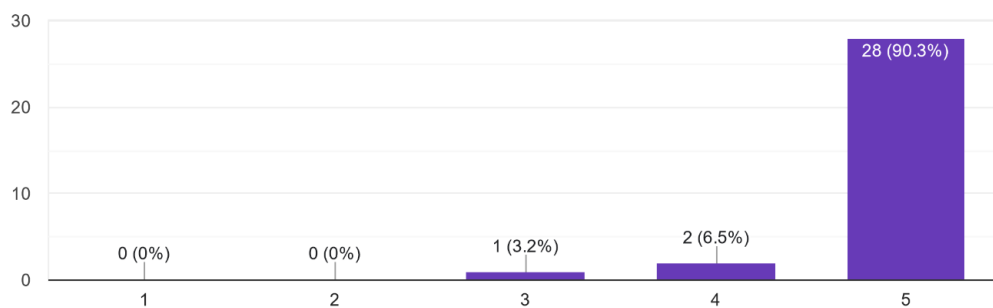
Sejak pandemi Covid-19, berapa lama anda menggunakan AC dalam sehari?  
31 responses



*Figure 4.11 AC Maintenance Usage Time during Pandemic*

This chart shows the use of ac during the pandemic by respondents. Most of the respondents use air conditioning for 6-12 hours a day, with a percentage of 51.6%. After that, 22.6% of respondents used air conditioning for more than 12 hours, and the rest used air conditioning for less than 6 hours a day during a pandemic.

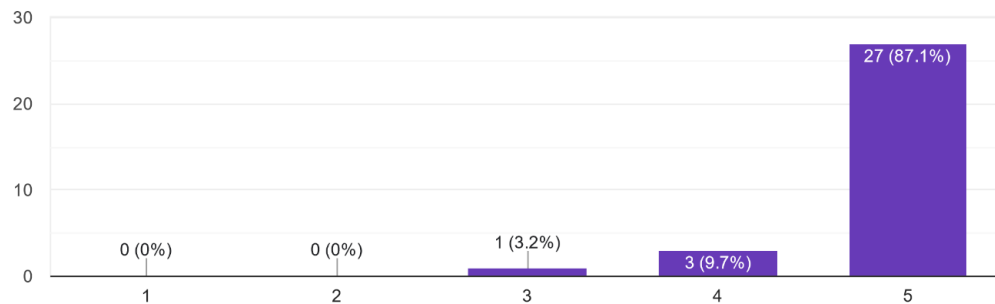
Dalam skala 1-5, seberapa penting kebersihan udara menurut anda?  
31 responses



*Figure 4.12 Air Quality Preference*

This graph shows the opinion of respondents on air cleanliness. Almost all respondents agree that air cleanliness is essential. It can be seen that the highest score with a value of 90.3% of respondents gave a scale of 5. It shows that respondents are aware of the indoor air quality around them.

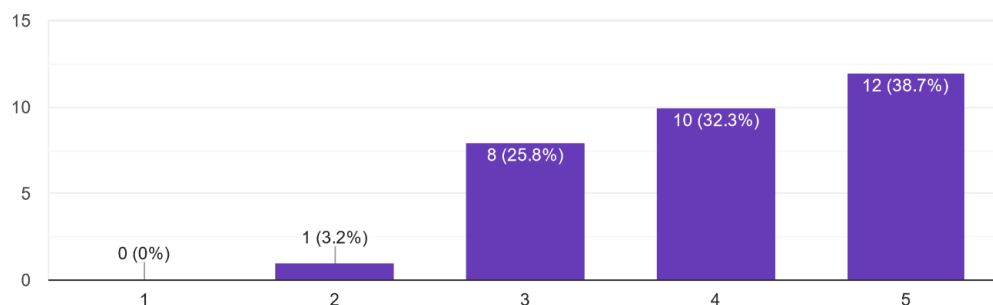
Dalam skala 1-5, seberapa penting kebersihan benda dan ruangan menurut anda?  
31 responses



*Figure 4.13 Hygiene of Objects Chart*

Not only air cleanliness but the chart also shows that almost all respondents agree that the cleanliness of objects and rooms is essential. It can be seen from the results of the respondents' answers that none chose an answer that did not agree with the existing questions.

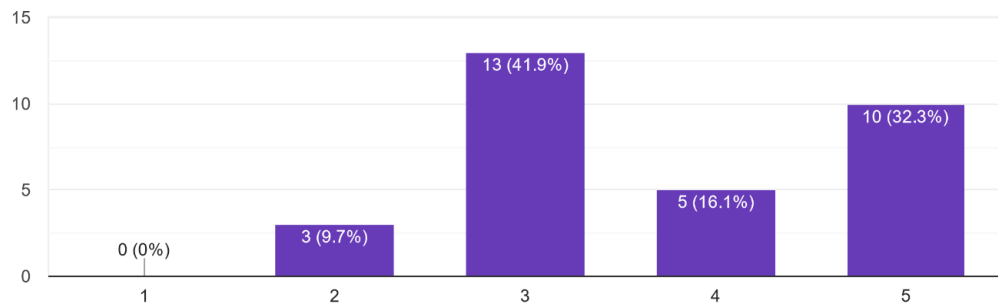
Dalam skala 1-5, menurut anda seberapa cepat penyebaran covid-19 melalui udara?  
31 responses



*Figure 4.14 Opinion of Covid-19 Transmission through Air*

More than 50% of respondents believe that the spread of the virus, especially COVID-19, through the air, is included in the rapid spread. Respondents who disagreed were only about 3.2% of the total respondents who had filled out this questionnaire.

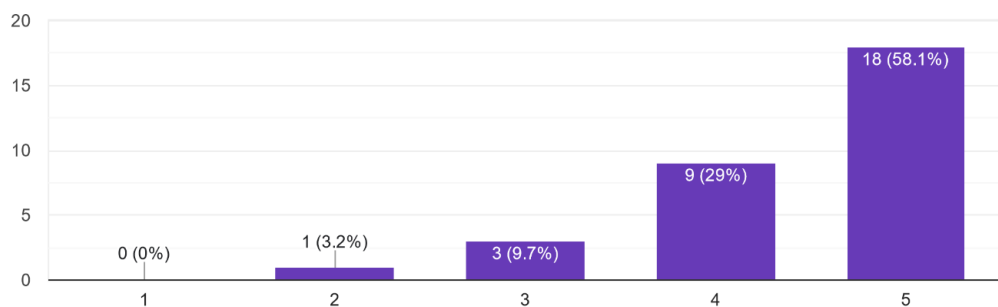
Dalam skala 1-5, menurut anda seberapa cepat penyebaran covid-19 melalui benda?  
31 responses



*Figure 4.15 Opinion of Covid-19 spreading through fomite transmission*

The figure shows the opinion of respondents about Covid19 spreading, and 48.4% of respondents agreed with the question that covid19 is quickly spreading through the surface of objects. At the same time, the respondents who disagreed were 9.7% from the whole respondents.

Apakah anda memerlukan suatu produk yang dapat membunuh virus, kuman, dan bakteri pada indoor AC anda?  
31 responses

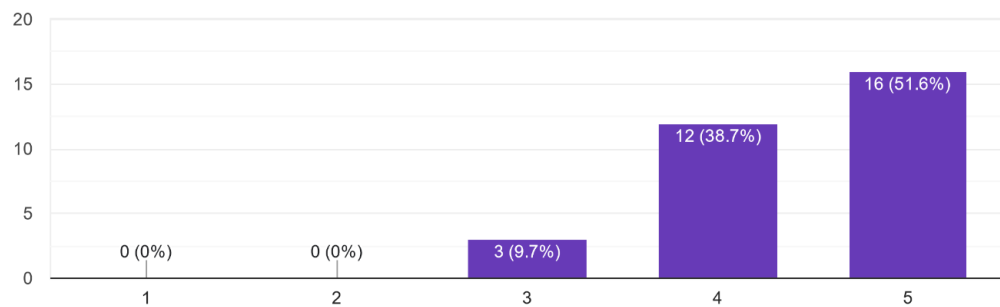


*Figure 4.16 Opinion through the product on the AC*

The given bar in the figure shows the respondent's opinion on a product that can kill viruses, germs, and bacteria in the air conditioner, and 87.1% of respondents agreed that they need anti-virus, germs, and bacterial product. At the same time, respondents did not agree, only 3.2% of the respondents.

Apakah anda memerlukan suatu produk yang dapat membunuh virus, kuman, dan bakteri pada benda atau ruangan anda?

31 responses



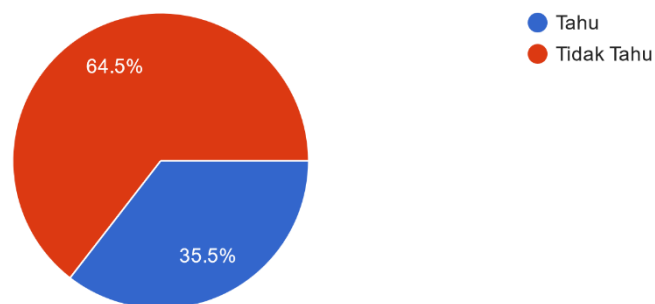
*Figure 4.17 Opinion through the product*

The given bar in the figure shows the respondent's opinion on a product that can kill viruses, germs, and bacteria on objects in the room, and 90.3% of respondents agreed that they need anti-virus, germs, and bacterial product. In comparison, no respondent disagreed.

## B. Market Research Analysis

Apakah Anda sudah mengetahui alat UVC tersebut sebelumnya?

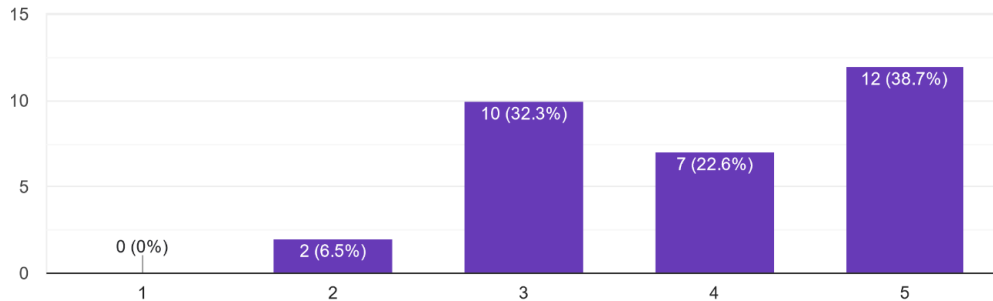
31 responses



*Figure 4.18 UVC Awareness*

The pie chart represents how many respondents know UVC LED and the function of this product. 64.5% of respondents are unfamiliar with this product before, while the remaining 35.5% are familiar with this product and its function for hygiene.

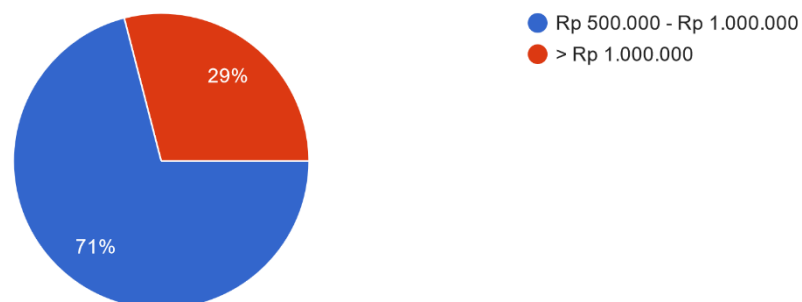
Saat pandemi, penjualan air purifier meningkat. Jika terdapat produk yang menggabungkan fungsi air purifier dan air conditioner dengan memasang U...la 1-5, seberapa tertarik anda dengan produk ini?  
31 responses



*Figure 4.19 UVC LED Preference*

The bar chart shows the interest of respondents in UVC LED products. More than 50 % of respondents are interested in having this product which is 38,7% very interesting, and 22,6% are interested in the reason when the functions of the air purifier and air conditioner are combined, it will be more efficient because AC users do not need to buy separate air purifier products. Besides that, the rest respondent has not had an interest in this product because they are not needed yet.

Berdasarkan data dari salah satu E-commerce di Indonesia, harga pembelian UVC LED untuk AC Split seperti yang tertera di gambar. Menurut p...tuk pembelian serta pemasangan UVC LED pada AC?  
31 responses

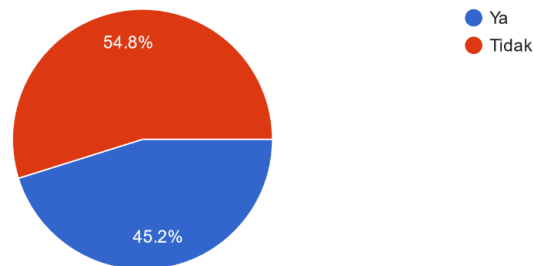


*Figure 4.20 Preference Price of UVC*

The pie chart shows the respondents who think that the appropriate price for the purchase and installation of UVC LEDs on air conditioners is IDR 500.000 to IDR 1.000.000, as

much as 71%. Meanwhile, only 29% of respondents think that the right price is more than IDR 1.000.000

Apakah anda mengetahui disinfektan fogging yang aman untuk segala jenis permukaan benda?  
31 responses

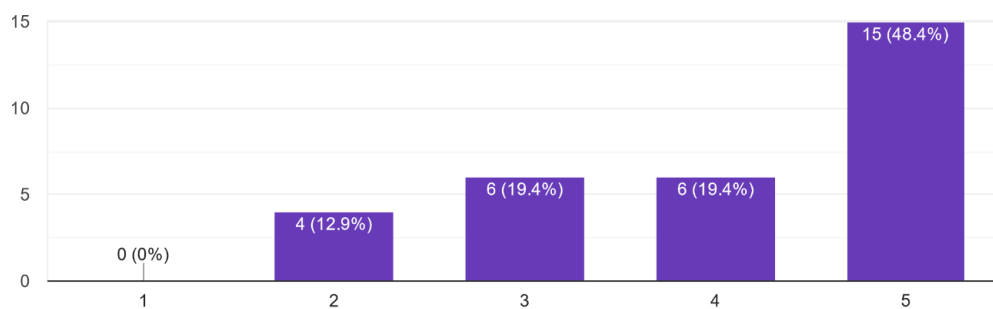


*Figure 4.21 Product Awareness of Fogging Disinfectant*

The pie chart represents how many respondents know fogging disinfectant for every surface, even for electronic. 54.8% of respondents are unfamiliar with this product before, while the remaining 35.5% are familiar with this product and its function for hygiene.

Saat pandemi, penggunaan disinfektan meningkat. Jika terdapat jasa fogging disinfektan yang aman bagi semua jenis benda seperti elektronik, seberapa tertarik anda dengan jasa ini?

31 responses



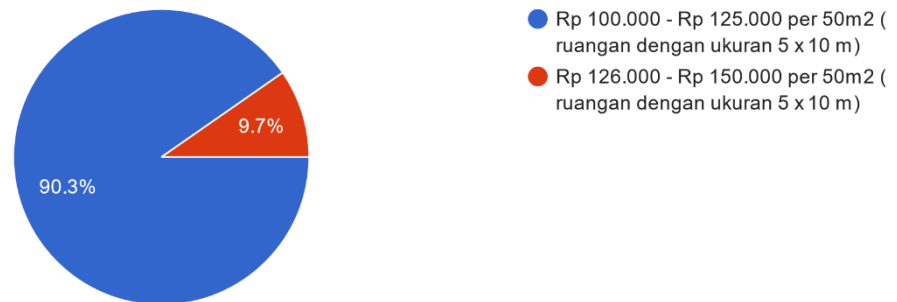
*Figure 4.22 Fogging Disinfectant Preference*

The bar chart shows the interest of respondents in fogging disinfectants. More than 50% of respondents are interested in having this product which is 48.4% very interesting, and 19.4% are interested because the manufacture of independent disinfectants is not

guaranteed and is complicated. Besides that, the rest of the respondents have not been interested in this product because they are not yet needed.

Menurut anda, berapa harga yang sesuai untuk jasa fogging disinfektan dengan formula yang aman untuk segala jenis benda seperti elektronik?

31 responses



*Figure 4.23 Price Preference of Fogging Disinfectant*

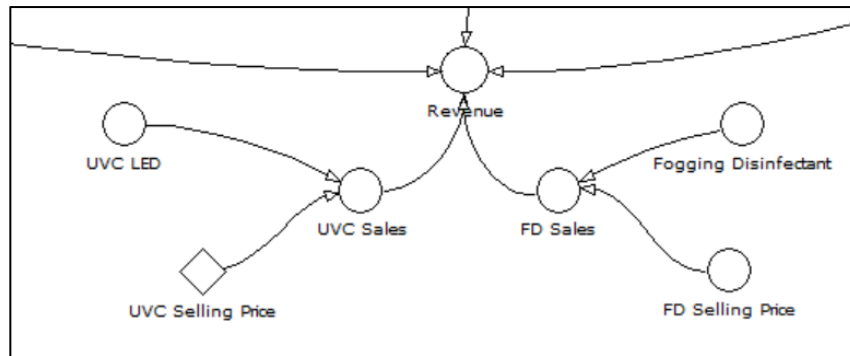
The pie chart shows the appropriate price for a disinfectant fogging service with a safe formula for all types of objects such as electronics. The result is more than 90% of respondents think that the appropriate price for it is IDR 100.000 to IDR 125.000 per 50m<sup>2</sup> (room with a size 5x10m). Meanwhile, less than 10% of respondents think that the appropriate price is IDR 126.000 to IDR 150.000 per 50m<sup>2</sup> (room with a size 5x10m).

#### 4.8 Design Improvement

Design improvement is a stage in the simulation to design and obtain alternative models that can improve a system. The previous simulation model is a model to determine the effect of risks on income at PT. Fath Jaya Lestari. It is known that revenue during the pandemic experienced significant fluctuations. Therefore, it is necessary to take mitigation and control measures and risk causes to reduce them. Mitigation steps that are input into the model are based on predetermined mitigations. The following is a design improvement model:

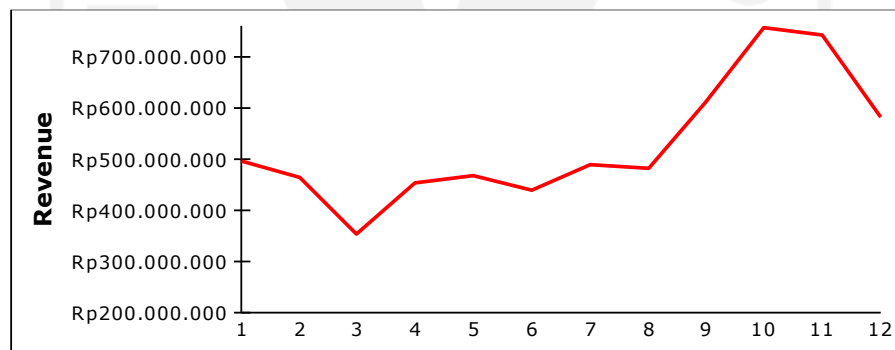
1. Providing Additional Product (UVC LED and Fogging Disinfectant)





*Figure 4.24 Additional Variable on Simulation*

The addition of variables made is the variable UVC LED selling price, UVC LED, UVC sales, fogging disinfectant, FD selling price, and FD sales. Based on those variables, the system dynamics simulation results will also differ from the previous situation. The following are the results of the simulation results of the experimental design.



*Figure 4.25 Design Improvement Simulation Result*

## CHAPTER V

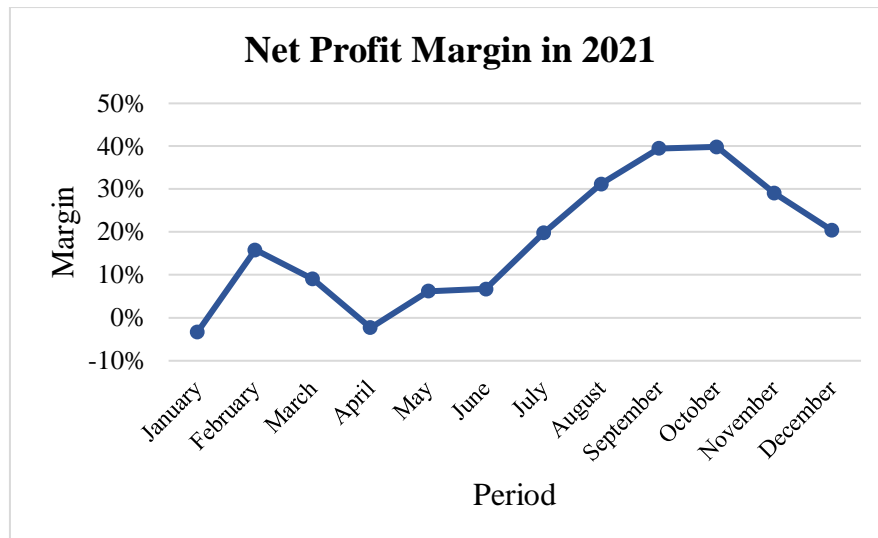
### DISCUSSION

#### 5.1 Company's Financial Performance Using Net Profit Margin

*Table 5.1 Result of NPM calculation in 2021*

| <b>Month</b> | <b>Revenue</b> | <b>Operational Cost</b> | <b>Interest and Tax</b> | <b>NPM</b> |
|--------------|----------------|-------------------------|-------------------------|------------|
| January      | Rp 113,230,900 | Rp 116,659,344          | Rp 337,700              | -3%        |
| February     | Rp 169,232,467 | Rp 142,128,817          | Rp 337,700              | 16%        |
| March        | Rp 133,693,250 | Rp 121,193,220          | Rp 337,700              | 9%         |
| April        | Rp 89,187,900  | Rp 90,881,432           | Rp 337,700              | -2%        |
| May          | Rp 100,734,620 | Rp 94,140,632           | Rp 337,700              | 6%         |
| June         | Rp 90,387,991  | Rp 83,918,681           | Rp 337,700              | 7%         |
| July         | Rp 170,248,560 | Rp 136,189,350          | Rp 337,700              | 20%        |
| August       | Rp 240,373,000 | Rp 165,010,510          | Rp 337,700              | 31%        |
| September    | Rp 236,412,500 | Rp 142,628,815          | Rp 337,700              | 40%        |
| October      | Rp 302,631,610 | Rp 181,636,630          | Rp 337,700              | 40%        |
| November     | Rp 539,913,794 | Rp 382,724,000          | Rp 337,700              | 29%        |
| December     | Rp 779,548,400 | Rp 620,179,600          | Rp 337,700              | 20%        |

From the results of the NPM calculation for 12 periods in 2021. In December, the highest achievement of revenue was Rp 779,548,400. However, when viewed from the profit margin, September and October had the highest profit margin, with revenue of Rp 236,412,500 and Rp 302,631,610 while an operating profit of Rp 142,628,815 and Rp 181,636,630.



*Figure 5.1 Graphic of Net Profit Margin in 2021*

Figure 5.1 shows a graph of fluctuations in the Net Profit Margin in 2021 at PT. Fath Jaya Lestari. The graph shows that the NPM decreased two times, from February to April and October to December. The increase in the value of the NPM also occurred from January to February and April to September.

Several factors affect the fluctuating value of NPM. One of them is the Covid-19 pandemic in Indonesia which affects the following companies:

#### 1. Income

Some customers decide not to use the company's services in maintaining their AC. Customers who are still working with FJL, most of whom have AC with a large capacity. It is because many companies implement the WFH system during the PPKM period according to the government's decision, and they decide to carry out AC maintenance with their technician.

The company's revenue comes from selling spare parts and routine and non-routine maintenance. Routine maintenance is standard maintenance for air conditioners with no problems or problems that can be handled with ordinary service procedures. The air conditioner is not cold because the air conditioner filter is dirty. Usually, AC maintenance is carried out at least once every three months for high-intensity use. The higher the intensity of the use of the air conditioner, the air conditioner must be cleaned frequently to clean the dust and dirt in the air conditioner filter. For non-routine

maintenance, it is maintenance for air conditioners with severe problems with regular maintenance procedures, such as freon that needs to be replaced or refilled, damaged capacitors, and other problems that ordinary people cannot solve about air conditioners.

Apart from maintenance, the company's revenue also comes from sales of spare parts and air conditioning units. The table shows that the most significant income occurred in December, but the NPM value is not the highest. It is due to most of the income comes from the sale of the air conditioning unit, where the purchase price of the ac unit increases during 2021, so the profit obtained is not significant. Recently, there has been an increase in the price of spare parts and ac units. However, the company cannot immediately increase the selling price to customers because more and more shops and other service provider companies dare to provide lower prices than those given by PT. FJL.

## 2. Expenditure

In the company's cash flow, several months have expenses close to their income. This is because the incoming income is reduced, but many needs must be met, such as electricity, internet, employee salaries, and other needs. During the covid-19 pandemic, PT. FJL does not reduce employees.

Some companies that still use FJL services require their technicians to check for Covid before entering the company, which is expensive. However, the company still had to follow the existing protocol. The company had to do mass swabs for all employees several times to track employees who were infected with the covid-19 virus. If there are employees identified as positive, they are required to self-isolate if there are no symptoms that need treatment at the hospital. The company bears the cost of treating several self-isolating employees for 14 days, starting with food, medication, and housing.

## 5.2 Marketing Risk Analysis

### 5.2.1 Risk Assessment using Risk Map Matrix

Based on the CLD image above, the author has identified 7 risk causes and calculated them using a probability index and severity index, then grouped the risks into a risk mapping according to their classification.

The company's revenue received will be used as evaluation material in the budgeting for promotion. The leadership will approve the promotion budget if the revenue evaluation a few months previously has exceeded the specified target and the promotion evaluation has a positive impact. The more promotion budget proposals are approved, the marketing department will have many programs in the promotion campaign as a medium to attract customer attention. Thus, more customers can be reached through this campaign. The more customers who are aware of the products and services offered by the company, the greater the buying decision and the level of sales will also increase. With the increase in sales volume, the revenue received by the company also increases.

Based on the analysis and identification of existing risks, it was found that the sources of risk R1 and R5 have a significant impact on the company, which can make business processes not run well. Efforts are needed to mitigate these risks. With risk mitigation, the company can minimize the company's level of risk.

### **5.2.2 Correlation Test using Pearson Correlation Method**

The test results show that the Covid-19 variable correlates significantly to the company's revenue. When viewed from the value of Sig. (2-tailed) between the variable covid-19 and revenue is 0.026, so the value of Sig. (2-tailed)  $< 0.05$ , means that there is a correlation between the two variables, from the value of Pearson's  $r$  – i.e., the correlation coefficient. That is the Pearson Correlation figure, which in this case is  $-.637$ . Pearson's  $r$  varies between  $+1$  and  $-1$ , where  $+1$  is a perfect positive correlation, and  $-1$  is a perfect negative correlation.  $0$  means there is no linear correlation at all. The figure shows  $-.637$  indicates a significant negative correlation. It means variable covid-19 has a negative impact on the company's revenue.

### **5.2.3 Risk Mitigation**

After knowing the results of the risk assessment and then selecting the risks that fall into the extreme category, namely the COVID-19 pandemic and a large number of competitors with the same product, then looking for suggestions for improvements to

these risks, in making suggestions for improvements in this study, two forms of proposals are used, namely product diversification the solution for a large number of competitors.

Solutions for covid-19 provide additional products or services for the new normal era. The methods that can be used are product diversification, a solution from the many existing competitors.

Product diversification was chosen as a solution to 2 prioritized risks. Product diversification by providing new products as additional alternatives but still in the company's line. This can open up new markets but not leave the old target market. The author proposed to offer two additional products: fogging disinfection and installation of UVC led on the air conditioner.

### **5.3 Product Diversification**

Several journals state that product diversification has a positive impact on company performance. Diversification has been shown in numerous research that positively impacts businesses. Diversification improves resource allocation efficiency by lowering transaction costs (Weston, 1970), increases asset utilization and profitability (Teece, 1982, Williamson, 1975), protects against volatility (downside risk) in the acquisition of revenue (Andrew, 2013), and supports the risk-reward trade-off (Andrew, 2013). (Amit and Livnat, 1989).

#### **5.3.1 UVC LED**

UVC claims to kill germs, bacteria, and viruses commonly used in air purifiers. UVC rays will disrupt DNA bases, especially thymine bases in microorganisms. Absorption of this light will form thymine dimers that will deactivate the DNA strand if formed in large quantities. That way, DNA replication will be disrupted so that the virus will eventually become inactive or die. Thus, the installation of UVC LEDs adds to the air conditioner's function, not only cooling but also killing viruses that are currently everyone's concern. Switch the function of the air purifier to ac.

##### **A. Specification of UVC LED**

A method used to kill germs, such as viruses and bacteria, by destroying nucleic acids and proteins. This damage makes the germs unable to complete the processes needed to live gradually.

Columbia University Medical Center reports for the first time that shallow doses of Far-UVC light kill more than 95% of the H1N1 influenza virus in the air. Far-UVC is ultraviolet C (UV-C) light that emits a narrow spectrum of UV-C at a wavelength of about 222 nanometres. [6]

An air sterilizer designed to use ultraviolet light with a wavelength ( $\lambda$ ). This tool can reduce the very significant number of bacteria, reaching 92.7% for bacteria-type microorganisms and 94.1% for fungi in a room volume of 1 m<sup>3</sup> with a treatment time of 45 minutes [11]. In another study, a UV-C radiation-based room disinfection device consisting of four 30-watt Phillips TUV-T8 UV-C lamps placed on four different sides were tested. The test results show that UV-C exposure for 15 minutes is sufficient to remove the inoculum. [12].

The following are the UVC LED specifications proposed by the author:

*Table 5.2 UVC LED Specification*

|                          |   |                             |
|--------------------------|---|-----------------------------|
| Air Conditioner Spec.    |   |                             |
| Air Flow Rate            | : | 7.8 m <sup>3</sup> / minute |
| Dimension (H x W x D) cm | : | 28.3 x 80 x 19.5            |
| Area (m <sup>2</sup> )   | : | 0.2264                      |
| LED Strip Spec.          |   |                             |
| Band (nm)                | : | 254 nm                      |
| Power                    | : | 7 Watt                      |

With the specifications written in the table, the UVC dose used to kill viruses, germs, or bacteria for 60 seconds is based on calculations by Kowalski as follows:

*UVC Dose with 7 Watt LED*

$$D = E_t \times I_R$$

$$D = 60 \text{ s} \times 7/0.2264$$

$$D = 1855 \text{ J/m}^2$$

The UVC dose with the LED specification produces 1855 h/m<sup>2</sup> in 60 seconds. The following table shows that the percentage of virus inactivation with the dose used can inactivate the virus, reaching 99.99%.

UV-C lethal doses for SARS-CoV-2.

| <b>Viral inactivation (%)</b> | <b>UV-C dose (mJ/cm<sup>2</sup>)</b> | <b>Exposure time (s)</b> |
|-------------------------------|--------------------------------------|--------------------------|
| 90                            | 0.016                                | 0.01                     |
| 99                            | 0.706                                | 0.32                     |
| 99.9                          | 6.556                                | 2.98                     |
| 99.99                         | 31.880                               | 14.49                    |
| 99.999                        | 108.714                              | 49.42                    |

*Figure 5.2 UVC Lethal Dose for Covid-19*

## B. Installation Method

UVC LED is typically used for mini-split systems and other limited space applications. Because space is tight, the best place for mounting the LED lights is usually inside the supply vent, with the light shining onto the blower wheel (which is prone to the worst mold growth). Make sure the blower is clean before installation.

Air system preparation:

First, remove the cover, then detach the drain pan to access the area behind; for the system with a non-removable drain pan, remove louvers and baffles to access the area behind.



LED strip mounting:

First, determine the location for the LED strip, and clean the area with the alcohol wipe to make the area is clean before installation. Then, pass the connector cable through the hole. Peel off the paper from the adhesive backing on the LED strip a few inches at a time and press it down firmly onto the clean surface.

Power supply installation:

First, remove the control box cover and connect the wiring harness. Then, connect the LED strip in series and check the LED is working. Apply the UV warning sticker in an appropriate location.

### **5.3.2 Fogging Disinfection**

The application of fogging is intended to deal with the threat posed by aerosol particles and make it possible for disinfectants to fumigate into areas that cannot be reached by wiping alone. A liquid may fog when it produces a mist composed of extremely minute particles. The mist is allowed to spread across the confined area. After settling on surfaces for several minutes, the mist then helps eliminate germs and viruses on those surfaces before quickly dissipating. A fogging machine works by first aerosolizing liquids with massive low-pressure air and then distributing the resulting mist via a nozzle. Fogging a liquid may produce particles with a size of fewer than 20 microns, in contrast to the traditional method of spraying, which generates particles in the range of 50 microns.

#### **A. Specification of Tools**

The tool used to perform fomite disinfectant is an ultra-low volume (ULV) machine. ULV cold fogging machines do not utilize heat to spread chemicals, allowing them a very safe and dependable approach to treating a range of environments, particularly inside. This fogging machine generates a high-power, low-pressure stream of air that is forced through a nozzle to create a super-fine mist with the following advantages:

- Invisible Mist: Cold fogging machines don't produce a visible fog; however, you can still see a very fine mist as it leaves the nozzle.

- Adjustable Droplet Size: ULV fogging machines are equipped with nozzles that can be adjusted to produce droplets of a consistent size—from about 5 to <50 microns. This makes them useful for a wider variety of applications.
- Coating Action: The cold mist produced covers surfaces with the solution, creating the damp layer usually required for the full effectiveness of the chemical treatment.

The following are the specifications of the ULV cold fogging machine:

*Table 5.3 ULV Cold Fogging Machine Specification*

|                                |   |          |
|--------------------------------|---|----------|
| Power Supply (Watt)            | : | 1000     |
| Tank Capacity (ml)             | : | 7000     |
| Sprayer Volume (ml/min)        | : | 470      |
| Droplet Size ( $\mu\text{m}$ ) | : | 10 – 150 |

#### B. Specification of Chemical

*Table 5.4 Solution Specification*

|               |   |                   |
|---------------|---|-------------------|
| Solution name | : | Hypochlorous Acid |
| Concentration | : | 200 ppm           |

A good disinfectant and sanitizer should be safe for the skin, noncorrosive, effective in a variety of forms, and reasonably priced. In an oral maxillofacial surgery (OMS) practice, HOCl may be the disinfection of choice for coronaviruses. HOCl is an endogenous chemical found in all mammals that is efficient against a wide variety of bacteria. HOCl is produced by neutrophils, eosinophils, mononuclear phagocytes, and B lymphocytes in response to infection.

#### C. Operating Method

1. Before operating, inspect the machine.
2. Fill the tank with the water and select disinfectant solution at the proper amount.
3. To operate the fogging machine, plug the machine into the power source and switch on the power button to adjust the fogging strength as desired.

4. During operating the fogging, make sure to operate the machine facing away from the wind to allow the mist liquid to project properly.

## 5.4 Selling Price Determination

In determining the selling price, the researcher uses an as-is price setting, and then the price is set by adding a mark-up that is considered appropriate to the cost of the goods. The costs are classified into raw material costs and direct labour costs to form the cost of production. The raw material for installing UVC LEDs on the air conditioner is according to the air conditioner's dimensions. In this calculation, the author calculates the selling price for installing UVC LEDs on air conditioners with a capacity of 1 PK and fogging disinfectant for a room area of no more than 50 m<sup>2</sup>. The table shows that the total cost required to install UVC LED raw materials is Rp. 335.000, and fogging disinfectant is Rp. 28.000.

After calculating the costs incurred for raw materials, the next step is to determine the direct labour costs, which are remuneration provided by the company to all employees in the production process. From table 4.2, the total direct labour costs charged by each product are different, namely Rp. 75,000 and Rp. 45,000. Each employee works for 8 hours per day, starting from 08.00 to 16.00.

From table 4.4, it can be seen that the total cost of goods was Rp. 410,000 and 73,000. The result is the sum of the cost of raw materials and labour costs. Then the calculation of the selling price with the desired profit of the company uses the full costing approach; the production costs were Rp. 410,000 and Rp. 73,000, the result of the sum of the costs of raw materials and labour costs. The selling prices obtained were Rp. 574,000 and Rp. 110,000, with the company's desired profit of 40% for installing UVC LEDs and 50% for fogging disinfectants.

## 5.5 System Dynamic Simulation

### 5.5.1 Causal Loop Diagram

The high number of COVID-19 has caused the global economy to decline. Many companies have reduced or even suppressed the budget for the operation and maintenance of their assets so that the demand for care and even product purchases has

also decreased. This resulted in the number of sales obtained was also reduced. The decline in sales figures affects the amount of revenue received by the company.

In order to prevent the spread of the Covid-19 pandemic, the government issued WFH regulations, social distancing, and regional quarantine. This regulation causes several expeditions to experience delays, and the lead time required is getting longer. If the distribution is late, the payment from the customer also experiences a setback or delay. The revenue obtained does not meet the income target that has been set previously.

The results of operations run by PT. Fath Jaya Lestari is based on selling services and products at consumers' request. The higher the demand, the higher the number of sales obtained by the company. However, the high demand has also resulted in the emergence of companies and shops that offer almost the same products and services, so many competitors dare to offer lower prices for the same products. Here the company goes away. If craving to keep winning the competition, the selling price must be suppressed, and the profit earned decreases. On the other hand, the company will lose customers if more competitors offer lower prices. This has an impact on the income received by the company will also decrease.

The company's revenue received will be used as evaluation material in the budgeting for promotion. The leadership will approve the promotion budget if the revenue evaluation a few months previously has exceeded the specified target and the promotion evaluation has a positive impact. The more promotion budget proposals are approved, the marketing department will have many programs in the promotion campaign as a medium to attract customer attention. Thus, more customers can be reached through this campaign. The more customers who are aware of the products and services offered by the company, the greater the buying decision and the level of sales will also increase. With the increase in sales volume, the revenue received by the company also increases.

## **5.6 Market Research Analysis**

### **5.6.1 Pre-Survey**

Respondents in this study are people who use air conditioners. The data is collected by spreading the online questionnaire given to people who use air conditioners daily. The

questionnaire was created using Google Forms, and it spreads via Whatsapp. The pre-survey aims to ensure that the respondents meet the target specifications.

The selected respondents are those who use air conditioners daily. Most of the respondents bought the air conditioner from a retailer. It could be due to the difference in prices offered by retailers, where they dare to provide lower prices than those offered by authorized dealers. Whereas retailers and authorized dealers supply products from the same distributor, they get the exact purchase price. Most respondents perform ac maintenance with ac maintenance service providers with professional technicians who have conducted training on air conditioners.

In contrast to air conditioning repairers, AC technicians (certified) will certainly understand more about installing air conditioners, either installing new or replacing air conditioners. Not only that, using the services of a company with an ac technician will provide a guarantee if there are problems during the warranty period. Unlike the ac repairman, if there are problems or damage due to the installation procedure, the shop guarantee cannot apply.

Based on the survey results, the average respondent has used air conditioners for a long time. However, there are still many people who do not routinely carry out AC maintenance. It can be seen from the answers of respondents who answered not sure when asked how many times the respondent did AC maintenance in a year. Usually, this customer is a customer who does ac maintenance if they experience problems with their ac, such as the ac is not cold, and the air conditioner is leaking, the air conditioner emits an unpleasant smell.

Based on the questionnaire results in chapter 4, most people use air conditioning, about 6-12 hours a day. The survey results also found differences in the use of air conditioning before and during the pandemic. AC usage for more than 12 hours increased from 19,4 percent to 22,6 percent. Due to activity restrictions, this increase occurred because many companies and schools had to carry out activities from home. At the same time, the percentage of respondents who use ac for less than 3 hours has also increased. It is the same reason as before, where these ac users are ac users within the office. Some respondents are ac users only when they are in the office.

During the COVID-19 pandemic, everyone has become more aware of environmental cleanliness, including air cleanliness. Based on articles published by WHO, briefly describe the possible modes of transmission of SARS-CoV-2, including contact, droplet (splash), airborne, fomite, fecal-oral, blood-borne, mother-to-child transmission, and animal to human.

### **5.6.2 Market Analysis**

The data is collected by spreading the online questionnaire given to people who use air conditioners daily. The questionnaire was created using Google Forms, and it spread via Whatsapp. The primary purpose of this questionnaire is to know the potential of the suggested product in the market.

Based on the survey result, most respondents agree that they need a product stated in the questionnaire, UVC LED, to kill germs, bacteria, and viruses in indoor air conditioners. Furthermore, a disinfectant fogging service can be used for all types of material objects. Because for this product, the liquid used is a special formula safe for all objects. So that customers do not have to bother and worry about disinfecting electronic goods and do not need to disinfect with their concoction as circulating on the internet, namely with bleach dissolved in water. However, this mixture is unsuitable for electronics, skin, and breathing if inhaled.

For the price offered, the researcher has made observations for the product proposed. Several companies or shops have offered products offered by researchers. However, they are outside the scope of the research area, namely Balikpapan, and East Kalimantan. Most of them are located on the island of Java, so by adding shipping costs, the costs will be more. Meanwhile, the product proposed by the researcher does not only sell the product but also includes the installation of the product so that customers do not have to pay any more to hire a technician to install this product to their ac.

### **5.6.3 Data Utilization after Pandemic Situation**

Based on the results of the market research questionnaire obtained from this study, it shows that the level of awareness of the proposed products is high, which is more than 50%. So far, the urgency of using supporting products with additional health functions has attracted many enthusiasts with the Covid-19 pandemic. The Covid-19 pandemic has

increased the awareness of the Indonesian people about their health conditions. In the future, these data can be used as evidence that people are aware of these products and the basics for marketing. In the future, a marketing approach is needed that can change the level of awareness in sales. One of them is by determining segmenting, targeting, and positioning. The main focus in this STP marketing model is on the audience approach, not the product. This model focuses on selecting the segments that are most valuable to the business when designing a product marketing strategy so that the delivery of messages is more relevant to each of these audience segments.

### **5.7 System Dynamic Model Analysis**

Based on the simulation results from the system model that has been made, it can be seen that the behaviour of each variable that becomes the reference for system performance tends to fluctuate. The fluctuation of these variables results from changes in demand for needs that are difficult to control. One of the influencing factors is the Covid-19 pandemic which has an impact on weakening economic development. Therefore, there has been a significant decrease in the amount of demand. As a company that provides AC units, spare parts, and materials, distribution is one of the crucial things to pay attention to because, for some types of AC or spare parts, the company does have inventory that must be stored so that if there is a demand for these items, they must be indented and sent from Jakarta as the central warehouse. Or directly from the assembly factory. If the delivery is from the fastest time, it takes about 14 days, but sometimes it can be more. For shipments from abroad, namely, directly from the assembly plant, it can take an even longer time because usually, the order must transit in several places before being sent to the company's address. With the pandemic, the company's distribution process experienced problems, namely the delivery time, which took longer than before the pandemic. Distribution delayed is due to restrictions on activities by the government so that this happens.

Not only that, but the pandemic also impacts economic growth in Indonesia and the world, wherewith the decline in economic growth, the amount of demand will also decrease. Apart from the pandemic, business competition is also a factor that affects the company's revenue seen from the sales variable, whose value fluctuates. In the model that has been made, the risk factor affecting revenue is the level of sales represented by the demand being met and the amount of company spending. In the model built, it can be seen that the

income always obtained increases which were initially worth 0 rupiahs. After completing the simulation, the income obtained reached Rp. 1,228,911,248 with monthly income varying between Rp. 80,000,000 to Rp. 1,000,000,000 every month.

In addition, the system dynamics model that has been created by the researcher has met the requirements of the validation technique, namely statistical tests. In the statistical test, the researcher uses a statistical test, namely the Equality of Means Test, with the parameter being tested is the amount of company income. The results of the test, the model is declared valid with a T-count in the Equality of Means Test is -0.96 with a limit of  $-2.048 < X < 2.048$ . This means that  $H_0$  is accepted based on statistical tests.

## 5.8 Design Improvement Model Analysis

The experimental design is carried out to reduce the potential for risk events caused by the risk agent by making suggestions for improvements that are right on target and can be applied to the company. Before the researcher makes steps to manage risk, interviews, and discussions with experts on handling strategies that can handle risk agents are carried out and later proposed by the researchers. In the system dynamics model, experimental design can be done by changing the variables and relationships (links) contained in the model or by adding new variables to a model.

Currently, FJL's source of income comes from 3 sales sources: sales of air conditioning units, sales of materials, and air conditioning maintenance services. In selling AC units, FJL still needs to improve because, in this aspect, FJL is still inferior to AC retailers who sell at lower prices. Not only from the aspect of selling AC units but from sales of AC maintenance services also experiencing the same thing.

Based on the experimental design, the researchers tried to add auxiliary variables, namely UVC LED, UVC selling price, UVC sales, fogging disinfectant, FD selling price, and FD sales variables. In the UVC LED and fogging disinfectant variables, the researchers used the distribution of historical maintenance data and spare parts sales. The researcher uses the data from the pricing calculation in the previous chapter for the selling price variable. The result is that in the proposed model, there is an increase in revenue from the design improvement model. From this, it can be concluded that adding supporting products can help companies improve their performance.



The additional product aims to increase the company's financial performance, which in the initial condition, there is an NPM value which is under 0%. Adding some supporting products that are expected to meet customer needs can increase the company's revenue and the resulting profit. Not only that, but the addition of supporting products can also increase the company's target market. Many respondents agreed that the product suggested by the researcher was the product they required, particularly during the pandemic, as seen by the questionnaire findings, which revealed that some respondents did not use services from air conditioner service providers. It proves that the firm not only strengthens its existing target markets the consumers who have already used the company's services. But also expands its new target market, which is people who have never used the company's service.



## CHAPTER VI

### CONCLUSION AND RECOMMENDATION

#### 6.1 Conclusion

1. Based on the research, the performance of the company can be measured using the Net Profit Margin calculation, and the result is that value of NPM in 2021 has a negative value NPM in January and April. There are several factors that impact the revenue, and the risk mapping shows there are 4 risks with 7 sources of risk. Based on risk mapping, the risk that should be solved first is a large number of competitors and the Covid 19 pandemic.
2. The proposed mitigation in this study is product diversification and providing additional products or services for the new normal era, which is fogging disinfection and installation of UVC LED on the air conditioner. The result of the simulation by adding 2 additional products to the system shows that the revenue of the company is increasing, and from the customer's side based on the survey indicates that more than 50% of the respondents are interested in the proposed product, UVC LED which is claimed that its radiation has effectively been used to kill viruses and bacteria and fogging disinfection to reduce fomite transmission of viruses and bacteria on the object surface, especially that are not accessible.

#### 6.2 Recommendation

1. Doing more research to explore more solutions that can be used for the company.
2. Conduct further research by equipping marketing methods such as marketing mix to help formulate effective marketing strategies so that companies can communicate products to the right target market and with the right message.

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