# CHAPTER I INTRODUCTION

In this chapter, there will be explanations about background, problems, purpose, output, and the benefit of the business

## Background

Nowadays, in the era of Covid-19 pandemic, logistic infrastructure for distributing medicine and vaccines is becoming more important. It is especially for infrastructure used in the land distribution, like roads. Roads become essential for the distribution so as to improve the efficiency of the concept of herd immunity by fastening the speed of distribution. By doing that, the target for the majority of people vaccinated can be reached faster. Besides all of those, roads are also essential for economics. Workers, students, or even the online store owner depend on the road to do their business (delivering the product). It is also true for the business of e-commerce like Tokopedia or Bukalapak which also serve the delivery service for their product.

The damage of the road is usually identified by two ways, the first is by direct observation, the second is by the report of the people around the road about the damage/crack that is happening. Unfortunately, the detection of the road damage is still not efficient enough. Often, the damage of the road is not identified and in the worst-case scenario, it becomes the reason of accident. Recently, there are accident related to the paddy truck in Kramatwatu, Banten this April. Based on the respondent there, accidents are usually happening in that place because of the big hole on the road. Not only this, earlier there were also several accidents related to the road crack across Indonesia. It shows that the current detection mechanism for road crack in Indonesia is actually still lacking.

Therefore, in this project, the authors want to solve this problem using machine learning, especially using tensorflow. By doing this project, hopefully there will be an increase in the efficiency of the road crack detection mechanism to reduce the accidents caused by the road crack happening again.

## Problem Formulation

The problem that the authors want to solve is how to develop an efficient way to determine the road conditions using machine learning technology.

## Business Purpose

The purpose of this project is to develop an efficient way to determine the road crack using machine learning technology especially Tensorflow in the form of applications.

## Expected Output

The expected output of this project is an application of crack detection using machine learning methods. It will show the number and types of cracks to show the level of damages of specific roads that the user searches.

## Product’s Benefit

The benefits when implementing this application are:

* Increasing the efficiency of detecting the road crack
* Decreasing the cost of identifying the road crack
* Decreasing the emission emitted as a result of transportation for surveying the road.
* Indirectly reducing the accident caused by the road crack.

# CHAPTER II APPLICATION DESCRIPTION

In this chapter, there will be an explanation on the profile of the application, application’s system architecture, and the application’s functionality, also the target of application.

## Profile of the Application

In this subchapter, there will be explanations about the name of the company, logo of the company, also the vision and mission of the application.

### Name of Application

The name of applications is “ “.

### Logo of Application

The logo of the application can be seen below.

### Vision and Mission of the application

The vision of the application is to become the first application to help the government inspect the road cracks to help reduce the number of accidents related to road conditions.

The mission of the application is to help detect the number and cracks that happen in the specific address that is inputted.

## Application’s System Architecture

In this subchapter, there will be explanation about the system architecture of the application. The system architectures can be explained as follows.

## Application’s Functionality

In this subchapter, there will be explanations about the functions of the application. The applications work using the following steps:

1. The user input the address that the user wants to infer for its crack condition.
2. The machine captures the real-life data in form of image from the Google Street view API
3. Detect the number of crack and the type of crack
4. Compile them and present them to the user.

This application works using machine learning concepts for detecting the condition of the road, especially regarding the number of cracks and its type, so the user can get the overall condition of the road. This also gives some reference on the condition and position of the cracks so that we can plan the correct maintenance strategy for the road so it makes the cost become more efficient.

## SWOT Analysis

In this subchapter, there will be explanations about the strength, weakness, opportunity, and threat for the application in form of table. The SWOT Analysis can be seen in the table below.

Table . SWOT Analysis

|  |  |  |
| --- | --- | --- |
| Internal Factors | Strengths:   * Have the expertise in all of the area needed for the development of application * Reduced efficiency on the direct observation on the road | Weaknesses:   * There are some people who are still in trouble using the technology * Needs to have some trainings in using the product’s function |
| External Factors | Opportunity:   * There are less competitors because it is a new concept of product * There are extensive number of roads which make the checking have great potential to improve | Threat:   * The accuracy needs to be high to make sure the user trusts our application * Miss in the prediction can cause unnecessary cost for the government * Many undetected |

*(Source: Personal)*

# CHAPTER III BUSINESS SUPPORT STRUCTURE

In this chapter, there will be explanations about the operational plan, the organizational structure for the business, marketing and promotional strategy, business timeline and business continuity.

## Operational Plan

This application is an application that is made in order to make the system of detection of cracks on the road to become more efficient in order to increase the effectiveness of the maintenance plan which will reduce accidents related to the road condition. With the vision of becoming the first application to help the government to check for the road cracks, it has an overall purpose to help the government to better formulate the strategy to maintain the road so as to reduce the risk of accidents. So, in the concept, we try to change instead of reactive on the reporting from the people, we are proactive to check the crack in the road.

 This application works when the user inputs the road and chooses the length that they want to be observed. In supporting this work, there are 3 things that need to be considered, which represent the 3 paths, Machine learning, Cloud Computing, and Mobile Development. In the machine learning part, the model needs to be updated and needs to be added on its new data to be used as training. In the cloud computing part, the server needed to have to be maintained every day in order to keep it working well and saving the data. In the mobile development part, the application needs to be maintained regularly to check for bugs or other operational problems.

## Organizational Structure

Below is the organizational structure of the business:

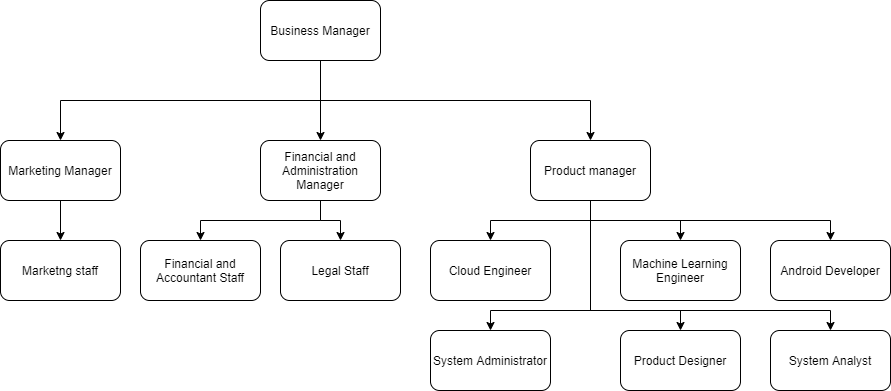


Figure . Organizational Structure of the Company

*(Source: Personal)*

The explanations on the organizational structure can be seen below:

1. Business manager: responsible for coordinating with the other manager regarding the overall business process.
2. Marketing manager: responsible for the marketing strategy of the company.
3. Financial and administration manager: responsible for financial and legal aspect of the company.
4. Product manager: responsible for managing the product, both front end and back end.
5. Marketing staff: responsible for doing marketing activities and implementing the marketing strategies.
6. Financial and accountant staff: responsible for all of the activity related to financial and accountant, either it is inflow or outflow.
7. Legal staff: responsible for all of the law aspects of activities.
8. Cloud engineer: responsible for developing and maintaining the server and database
9. Machine learning engineer: responsible for developing and maintaining detection algorithm
10. Android developer: responsible for developing and maintaining the application
11. System administrator: responsible for maintaining the system inside the application
12. Product designer: responsible for design of the application
13. System analyst: responsible for the analysing the system of application for further development

The organizational structure above divided based on its own responsibility and expertise. The total of the employee of the company is 20 people with details as follow:

Table . Detail of Employee of the Company

|  |  |
| --- | --- |
| Position | Number of Person |
| Business Manager | 1 Person |
| Marketing Manager | 1 Person |
| Financial and Administration Manager | 1 Person |
| Product Manager | 1 Person |
| Marketing Staff | 2 Persons |
| Financial and Accounting Staff | 1 Person |
| Legal Staff | 1 Person |
| Cloud Engineer | 2 Persons |
| Machine Learning Engineer | 2 Persons |
| Android Developer | 2 Persons |
| System Administrator | 1 Persons |
| Product Designer | 1 Persons |
| System Analyst | 1 Persons |
| Total | 17 Person |

*(Source: Personal)*

The full scale of employment happens in the year of 2022 as the company continues to grow, in the first phase of the employment only consist of 6 initial members of founding members, with addition of one person each month until reaching 19 expected number of persons.

## Marketing Strategy and Promotional Method

The marketing strategy of the company includes the target of usage and user, price of the product and application, and the marketing strategy using 4P (Product, Price, Promotion, Place) and STP (Segmentation, Targeting, Positioning).

1. Target of usage for the application
   1. The target of usage for the application is 500 usage
   2. The target of user using the applications is 50 users.
2. Price of the product

The services can be accessed in form of Android application without paying any money. This has purpose to attract many people to download the application and use it. The price of the usage is for each 10 meters scanned, the price would be $0.3 and must be paid before the result shows. There are of course free trial for the early user.

1. Marketing strategy

The marketing strategy of the company using the 4P methodology can be seen below.

* 1. Product

This crack detection application is a new concept of detecting road crack automatically with the low cost and easy to use. The user only needs to input the name of the road and specify which part of the road that needs to be considered. And after that, the application will process the input and scan the road to detect the crack type and number of cracks. It is then reported to the user to help the user identify the cracks.

* 1. Price

For the user that wants to access this application through Google Playstore, it can be downloaded for free. In each usage of the services, we will charge $10 for every usage regardless the length.

* 1. Promotion

The promotion of the application done differently for the 2 types of customers:

1. For the target of companies, the promotion is done by the usage of direct marketing, in which we approach directly to the company to promote our services, using the door-to-door method. It is also possible that the promotion is done using the directly offer at some event that gather the companies like job fair, etc. to introduce our services.
2. For the target of government, the promotion is not done the same with the company, instead we propose idea and projects in form of proposal to the government so that the government can know about our idea.
   1. Place

The place of promotion of this application is in Indonesia, but starts with Java island, as the road infrastructure in the Java island used more frequently compared to other islands of Indonesia.

1. Defining the market segmentation using STP method
   1. Segmentation: All of the construction company in Indonesia, especially Java, and also government.
   2. Targeting: The detection mechanism of road
   3. Positioning: An application to provide technology to provide services for detecting the road crack.

## Business Timeline

In making a business, there is a need to have step by step milestone so as to make sure the company grows. Below the timeline in the first year of business.

Table . Timeline of Business Activity

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Activity | Timeline | | | | | | | | | | | | | | | | | | | | | | | |
| 1st Month | | | | 2nd Month | | | | 3rd Month | | | | 4th Month | | | | 5th Month | | | | 6th Month | | | |
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| Making Application |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Testing Application |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Launching of Beta Application |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Gathering Data for Improvement |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Update Application |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Launching Application |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Application Promotion |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Periodic Evaluation |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1st Updates on Application |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 2nd Updates on Application |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

*(Source: Personal)*

## Business Continuity

The continuity of the business can be seen below.

Figure . Business Continuation Plan

*(Source: Personal)*

# CHAPTER IV FINANCIAL PLANNING

In this chapter, there will be explanations about the investment needs and capital requirement, the expense of the company, profit analysis and feasibility study.

## Investment Needs and Capital Requirement

Below is the plan for the source of funding for the company.

Table . Source of Funding

|  |  |  |
| --- | --- | --- |
| No | Description | Amount |
| 1 | Private Funds | $ 1000 |
| 2 | Investor Funding | $ 5000 |
| Total | | $ 6000 |

*(Source: Personal)*

## Expense of the Company

Below is the table showing the expense in the business operation.

Table . Expense Plan of the Company

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Fix Cost** | | | | |
| **Types of Expense** | **Usage Justification** | **Quantity** | **Price Each** | **Price** |
| Office | Place for workers to work | 1 unit | $4000 | $4000 |
| Modem Wifi 110 Mbps | Provide internet connection in the office | 2 unit | $80 | $160 |
| Total Fixed Cost | | | | $4160 |
| **Variable Cost** | | | | |
| Cloud Storage for Business | Data Storage of the company | 17 User | $6 | $102 |
| Playstore Account | Account for application in Playstore | 1 Year | $15 | $15 |
| Promotion Cost | Promotion of application | 1 Year | $750 | $750 |
| Water, electricity, etc | Cost for the office | 1 Year | $500 | $500 |
| Wage | Wage of the employees | 1 Year | $4875 | $4875 |
| Social Cost | Price for the social cost | 1 Year | $200 | $200 |
| Total Variable Cost without wage | | | | $1567 |
| Total Variable Cost with Wage | | | | $6442 |
| Total Initial Cost | | | | $5727 |

*(Source: Personal)*

The detail of the wages for the worker can be seen below.

Table . Wages of the Employees

|  |  |  |  |
| --- | --- | --- | --- |
| **Position** | **Quantity** | **Wage per person per month** | **Wages** |
| Business Manager | 1 Person | $400 | $400 |
| Marketing Manager | 1 Person | $325 | $325 |
| Financial and Administration Manager | 1 Person | $325 | $325 |
| Product Manager | 1 Person | $325 | $325 |
| Marketing Staff | 2 Persons | $200 | $400 |
| Financial and Accounting Staff | 1 Person | $200 | $200 |
| Legal Staff | 1 Person | $200 | $200 |
| Cloud Engineer | 2 Persons | $300 | $600 |
| Machine Learning Engineer | 2 Persons | $300 | $600 |
| Android Developer | 2 Persons | $300 | $600 |
| System Administrator | 1 Persons | $300 | $300 |
| Product Designer | 1 Persons | $300 | $300 |
| System Analyst | 1 Persons | $300 | $300 |
| Total | | | $4875 |

*(Source: Personal)*

## Profit Analysis

In this subchapter, there will be explanations and calculation on the profit analysis and also the break event point of the company. Using $10 as the price for each usage, assumed that each usage is around 1 km worth of road and screenshotted every 10 meters with each usage cost $0.007. For the first year, the target is 500 usages, 1000 usages for second year, and 2000 usages for third year

1. Profit analysis

Profit after variable cost = ($10 - $0.007x1000/10) x number of usages - expenses

= $9.3 x number of usages - expenses

For the 1st year = $9.3 x 500 - $1567

= $3083

For the 2nd year = $9.3 x 1000 - $6442

= $2,858

For the 3rd year = $9.3 x 2000 - $6442

= $12158

1. Break Even Point (BEP)

The break-even points happen in the second year after the reaching the value of fixed cost.

BEP = 1 + (fixed cost – profit for the 1st year) / profit for 2nd year

= 1 + ($4160 - $3083)/$2858

= 1 + 0.446

= 1.446

It means that the break-even points will be reached in around 1 year 5 months and 10 days using the data that have been stated here.

## Feasibility Study

In this subchapter, there will be explanations and calculation about the net present value, and internal rate of return.

1. Net Present Value (NPV)

The discount rate that is used in the calculation is assumed to be 5% each year. The table below shows the calculation of NPV

Table . Calculation of NPV

|  |  |  |  |
| --- | --- | --- | --- |
| **Year** | **Cash Flow** | **Discount Factor**  **(r = 5%)** | **Present Value** |
| 0 | -$4160 | 1 | -$4160 |
| 1 | $3083 | 0.952381 | $2936.19 |
| 2 | $2858 | 0.907029 | $2592.29 |
| 3 | $12158 | 0.863838 | $10502.54 |
| Total NPV | | | $11871.02 |

*(Source: Personal)*

Since the NPV shows positive number, it can be concluded that this business is feasible to be realized.

1. Internal Rate of Return (IRR)

The discount rate that is used in the calculation is assumed to be 5% each year. The table below shows the result of IRR.

Table . Result of IRR Calculation

|  |  |  |  |
| --- | --- | --- | --- |
| **Year** | **Cash Flow** | **Discount Factor**  **(r = 90.6025%)** | **Present Value** |
| 0 | -$4160 | 1 | -$4160 |
| 1 | $3083 | 0.524652 | $1617.502 |
| 2 | $2858 | 0.27526 | $786.6925 |
| 3 | $12158 | 0.144416 | $1755.805 |
| Total NPV | | | $0 |

*(Source: Personal)*

Based on the result above, the IRR of the company is 90.6025% which is higher than the discount rate, so the business is considered to be feasible to continue.

# CHAPTER V CONCLUSION AND SUGGESTION

## Conclusion

Road is one of the most important infrastructure in Indonesia, and detecting its condition and maintaining it is one of the upmost important things to consider. But unfortunately, the detection of the road is still not efficient and effective enough, and as a result resulted in the unwanted outcomes. Because of that, we want to make more efficient system to detect the crack of the road with less time and price so as to make better road maintenance strategy

We provide a cheaper price and faster way to detect the condition of the road compared to the direct observation. The user will get a better understanding of the road condition through our services thus making better road maintenance strategy. The marketing strategy of the company can be done to introduce our services is through door-to-door strategy and through proposed collaboration depends on the subjects. With this application, it is expected that Indonesia can have better maintenance strategy for its road so as improve its infrastructure and reduce the accident caused by the road condition.

## Suggestion

In the operational of the company, it needs to consider several aspects, including:

* Make simple and effective system to provide better user experience and understanding regarding the application
* The company can improve the feature of the application with other additional feature to increase the attractiveness of the application
* The market of the company can be expanded so as to improve the company’s growth.

# REFERENCE

Alwan, Hairul. (2021). *Akibat Jalan Rusak, Truk Pengangkut Padi Terbalik di Kramatwatu*. [ONLINE] Available at: https://banten.suara.com/read/2021/04/15/162653/akibat-jalan-rusak-truk-pengangkut-padi-terbalik-di-kramatwatu (Accessed 26 May 2021)

Google. (2021). *Street View Static API Usage and Billing.* [ONLINE] Available at: https://developers.google.com/maps/documentation/streetview/usage-and-billing (Accessed 30 May 2021)

Hamed Majidifard, Yaw Adu-Gyamfi, William G. Buttlar*, Deep machine learning approach to develop a new asphalt pavement condition index*, Construction and Building Materials, Volume 247, 2020, 118513, ISSN 0950-0618, https://doi.org/10.1016/j.conbuildmat.2020.118513.

Jassy, Daniel. (2021). *The Formula for Calculating Internal Rate of Return in Excel*. [ONLINE] Available at: https://www.investopedia.com/ask/answers/022615/what-formula-calculating-internal-rate-return-irr-excel.asp (Accessed 30 May 2021)

Kementrian Pekerjaan Umum dan Perumahan Rakyat. (2017). *Panduan Pemiihan Teknologi Pemeliharaan Preventif Perkerjan Jalan.* [ONLINE]. Available at: https://binamarga.pu.go.id/v3/assets/files/NSPK/pembangunan\_jalan/2017\_SE%20Dirjen%20PPandua%20Preventif%20Jalan%20(Stempel).pdf (Accessed 25 May 2021)

KompasTV Jember. (2021). *Ada 8 Kecelakaan Akibat Jalan rusak, 6 Pengendara Tewas.* [ONLINE] Available at: https://www.kompas.tv/article/139153/ada-8-kecelakaan-akibat-jalan-rusak-6-pengendara-tewas (Accessed 25 May 2021)

[Priharto, Sugi. (2021). *Strategu Pemasaran 4P: Pengertian, Penerapan, dan Contohnya.* [ONLINE] Available at: https://accurate.id/marketing-manajemen/strategi-pemasaran-4p/](Priharto,%20Sugi.%20(2021).%20Strategu%20Pemasaran%204P:%20Pengertian,%20Penerapan,%20dan%20Contohnya.%20%5bONLINE%5d%20Available%20at:%20https://accurate.id/marketing-manajemen/strategi-pemasaran-4p/) (Accessed 27 May 2021)

Smart Insights (Marketing Intelligence) Ltd. (2021). *Customer segmentation and targeting.* [ONLINE] Available at: https://www.smartinsights.com/digital-marketing-strategy/customer-segmentation-targeting/segmentation-targeting-and-positioning/ (Accessed 27 May 2021)