Smart EV Bus

Mongkol Company

Project Phase #1

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1. Detailed explanation of our business

Overview

At present, the number of people who use public transportation in Bangkok is very high based on the statistics on public transport usage. In Bangkok, 50% of the residents travel by bus because of its flexibility, expandability, low cost, and accessibility [1], [2]. However, there are still problems in many matters. For example, a few years ago, there was an epidemic of COVID-19, which required us to maintain a distance from each other and wear a mask all the time. Therefore, our company has invented a system of buses and an application for cashless payments, both scanned by palm or having a QR code as an alternative for all passengers. Our method is convenient for getting on and off the bus and relying on speed and accuracy.

In addition, we want to sell our system to companies that make Electric Bus (EV) to help reduce pollution.

Purpose of business plan

- To manage fares, and service levels in Bus Transport or Electric Bus (EV).
- To create an application that meets the needs of those waiting for the bus, cashless payment, and the matter of seating available or reserved seats for the disabled.
- To be able to register in many areas, whether it is a bank or counter service. (Palm recognition)
- To attract foreigners and tourists with its conveniences such as cashless payments, bus wait time, and the display result is in English.

1.1. Target customers or/and target consumers

From the research about **general Thai people's** public transport usage and our **survey** collecting statistical data, we found that our target group consists of <u>students, workers, foreigners/tourists, and advertisers or advertising agencies</u> [1].

<u>Target group</u>

Our first target group is **students**, most have an income below 15,000 baht. They only use public transportation to travel to School, University, or others. This target group is concerned about transportation **prices**.

The second target group is **working people**, most of them have an average income of 15,000 – 25,000 baht and use the bus the most frequently. According to the data, public transport has a price that is accessible to most people, but another factor they consider is the terms of technology. It will help increase **convenience** for people of this age because they want faster **speed** to travel to different places.

The third target group is **foreigners or tourists**, most come to work in Thailand or for holiday. They have enough money to pay for public transportation. Our bus route can take our customers to various destinations. Because our travel routes will be in areas where there are many foreigners, they may want a service that meets their needs, and it may require **technology** to help make their travels more **comfortable**.

<u>Advertiser or advertising agency</u>

Our last target group is **advertisers**. Our buses will be used as an advertising medium to reach the public with messages and promote commercial brands. For example, they contact our company for political or promotional campaigns as a tool for commercial companies.

Additional Information to analyze the target group.

1. Survey form
2. Based on the route

Survey Form

(A total of 100 people filled out the survey form.)

These are some examples of statistics we can get from questionnaires.

Age	
21.00%	Under 20
53.00%	20-29 years
06.00%	30-39 years
12.00%	40-49 years
06.00%	50-59 years
02.00%	60 and above

Occupation	
55.00%	Pupil/Student
27.00%	Office workers
03.00%	Work in the government service
06.00%	Personal business
04.00%	Freelance
05.00%	Other occupations: lab staff, Housewife, Butler, International Relations, Researcher

Education Level	
00.00%	Primary school
06.00%	Secondary school
02.00%	Vocational Certificate
79.00%	Bachelor's Degree
13.00%	Graduate Diploma and Above

The average personal income per month	
52.00%	Under 15,000 baht
09.00%	15,001 - 20,000 baht
04.00%	20,001 - 30,000 baht
06.00%	30,001 - 30,000 baht
06.00%	40,001 - 50,000 baht
08.00%	50,001 - 60,000 baht
15.00 %	60,001 baht and above

Do you use public transportation? (คุณใช้ระบบขนส่งสาธารณะหรือไม่?)
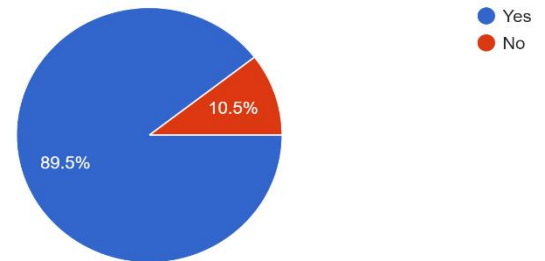100 responses

- Yes
- No

14%
86%
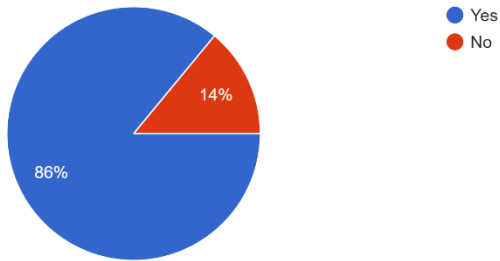
86%-Use public transportation | 14%-Didn't use public transportation.

Are you excited by new technology? (คุณตื่นเต้นกับเทคโนโลยีใหม่หรือไม่?)
86 responses

- Yes
- No

10.5%
89.5%

89.5%-Excited | 10.5%-Not excited

We will ask 86 of the 100 people who use public transportation about the new technology and whether they are excited about it. Following that, we asked people who were interested in new technology—89.5% of them—whether they would pay a higher bus fare for new technology.

If technology is introduced to facilitate the use of buses. Are you willing to pay a higher price? (หากมีการนำเทคโนโลยีเข้ามาอำนวยความสะดวกในก...รถโดยสาร คุณยินดีจ่ายในราคาที่สูงกว่านี้หรือไม่?)
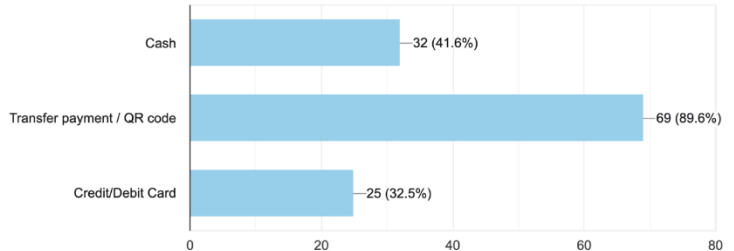77 responses

2 (2.6%) | 5 (6.5%) | 22 (28.6%) | 27 (35.1%) | 21 (27.3%)
1 | 2 | 3 | 4 | 5
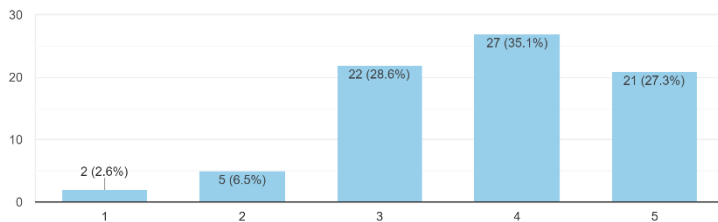
[1] 2.6% | [2] 6.5% | [3] 28.6% | [4] 35.1% \ [5] 27.3%

What payment methods are you comfortable with nowadays? (วิธีการชำระเงินที่คุณสะดวกในปัจจุบัน?)
77 responses

Cash — 32 (41.6%)
Transfer payment / QR code — 69 (89.6%)
Credit/Debit Card — 25 (32.5%)

Cash 41.6% | Transfer payment/QR-code 89.6% | Credit/Debit Card 32.5%

As a result, a score of 4-5 is considered to have a high rate of interest. That is 62.4% of people who use public transportation and are willing to pay a high fare. This represents 77 responses from people who use public transportation and are interested in new technology, while 9 people are not interested in new technology and 14 people who don't use public transportation. Our survey shows that people this age are most comfortable paying with a transfer payment/QR code, with about 40% of the total participants still using cash and only about 30% paying with credit/debit cards.
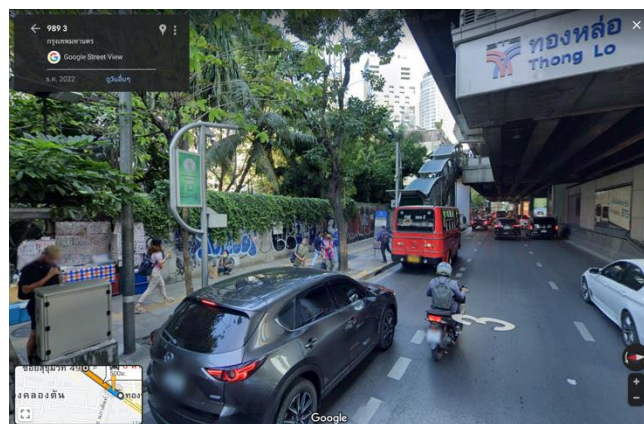
Based on the route
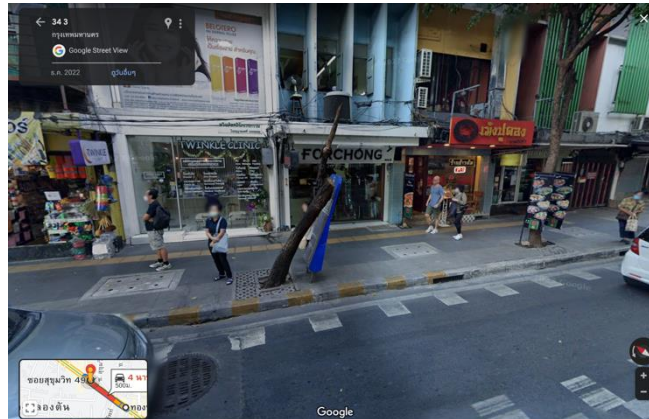
Bus Stop 1 – Soi Sukhumvit 49

      Soi Sukhumvit 49 is a long alley in the city center where there are many people inside the alley, whether students or workers. There are condos, shops, cafes, and schools that teach drawing and clay molding as well [2]. When people go out of the alley to look for a car or bus to take them to their next destination, they can find many vehicles including our buses.
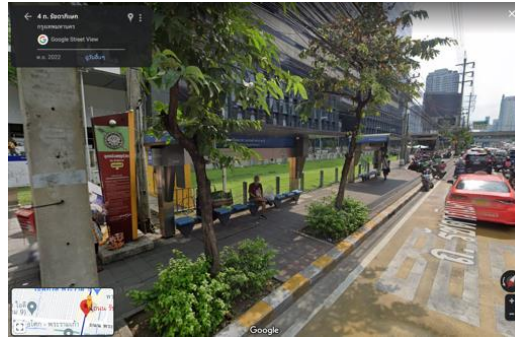
Target Customers

      Therefore, our target groups in this area are **students, Thai people, foreigners who come to travel, and company employees.**

Bus Stop 2 – BTS Thonglor Station (exit 1)

BTS Thonglor Station is a place close to tourist attractions and hotels [3].

Target Customers

So our targets would range from **students, people who come to travel, foreign tourists to company employees or people traveling through BTS** whom come to our public transport(buses) to continue.

Bus Stop 3 – Major Cineplex Sukhumvit (Ekamai)

Major Cineplex Sukhumvit is close to Ekamai BTS station. The opposite side is the Ekamai Gateway. Around Ekamai, it is close to Wat That Thong. In that area, it is close to many schools. For example, Wat That Thong School, Pathumkongka School, which has many students who use buses. In addition, around Ekamai area, there are frequent activities such as temple fairs.

Target Customers

The target groups of this area are **students and employees working in department stores or offices.**

6

From the article, Ratchadapisek Road, Bangkok offers numerous places for shoppers with its spectacular shopping malls. There are places to check out such as a night bazaar that's a local equivalent to Khao San Night Market. At the lower end of Ratchada, near Phra Ram 9 MRT station, there's an IT mall that's great for sourcing computer gear [4]. Not far is another shopping complex that looks very futuristic.

Target Customers

Our target groups for this area are **urban shoppers and tourists. With the huge number of shoppers and tourists,** we are certain that investing in this area will attract many customers.

Bus Stop 5 – Chong Nonsi
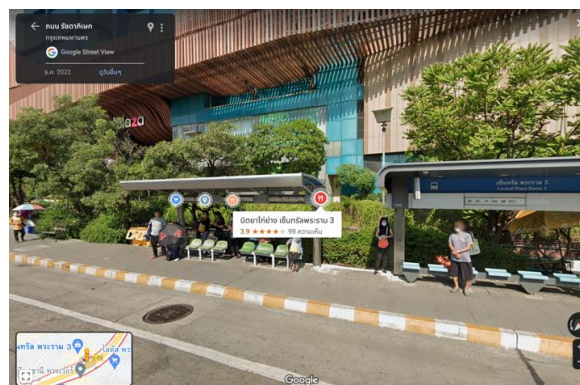
Chong Nonsi is a part of the Central Business District. It has very beautiful sky views in Bangkok [6] [5]. This area offers quality restaurants and dining areas as well as entertainment places. Chong Nonsi holds a wide range of Condo options which many of which are rented by professional workers [6].

Target Customers

       We would like to target the group of workers in this area. The BTS station, being connected to the BRT system, along with numerous entertainment places, and a wide variety of luxury Condos will attract many workers to use our bus system.

Bus Stop 6 – Thaniya Plaza

       Chong Nonsi, CBD area or Core Central Business District, the economic center, which is a **large job center with both Thai and foreign companies** grouped up more than 20 buildings in this area. Being dubbed as "Prime Area", [7] [8] It is the best location that can create value in perpetuity.

       From time immemorial, the Silom-Sathorn area was raised as an important economic district of Bangkok. Most areas of Silom are **filled with office buildings**. Including large department stores and if you look at the lifestyle, it's like a gathering place for high-income office workers. In addition to shopping centers, Silom will also be home to the headquarters of many companies such as Charoen Pokphand Foods Public Company Limited.

       Therefore, we would like to call this area collectively as Silom area. It is an important business center suitable for investment that helps generate worthwhile returns in the long term **surrounded by sources of work**. Lifestyles and facilities result in the demand for buying and selling and renting continuously every year. **As for living in this area, the cost of living is quite high, affecting the income of people who want to live that may require financial planning. If staying in this area, which may move to other nearby neighborhoods with cheaper cost of living.**

Target Customers

       Our target passengers during this distance will be able to divide into two main groups: **office workers and foreigners both coming to work and travel.** Even if their salary is high, they do not live near their work area. Which will require them to use public transport to travel at their place.

Bus Stop 7 – Benchakitti Park

       The new public park in the Bangkok area, it is called Benjakitti Forest [9], A place that has a lot of activities. Gathering place for people who **like exercising, taking walks, resting, and enjoying the greenery atmosphere.** Most importantly, it is a landmark to take pictures of the new generation [10]. It is open daily from **5:00 a.m. to 9:00 p.m.** According to statistics on people coming to this park, there were more than 500 people using the services on December 17, 2021, on the first day of operation. There were thousands of people by the end of the month. The statistics of service users will be greater in January 2022. Additionally, it went beyond 5,000 each day in February. Especially on Saturday and Sunday, when the service is used by the greatest number of people—up to 11,500 people—**The increasing number of visitors** to this park reflects a shift in preferences that has caused people to pay more attention to nature. This park has a museum building that can accommodate up to **3,000 people**, and also an amphitheater that can accommodate activities for more than **15,000 people**, including a route for exercise. Many photography spots make new generations want to come.

Near Benchakitti Park: **Queen Sirikit National Convention Center**

       This park is adjacent to the Queen Sirikit National Convention Center. This place renovates and expands the total area to 300,000 square meters, which can accommodate more than 100,000

attendees per day [11], [12]. It is the largest convention center in the heart of the city, and it is a place to organize meetings and other important events, such as the APEC 2022 Meeting. This center has organized more than 20,000 events, both nationally and internationally. As for the new look of the Queen Sirikit Center, the NCC expects that there will be **300–400 events per year** with more than **13 million visitors per year**. There are about **100 events per year**, of which 50% will be the same events that have been held at the center and 50% are new events that have never been organized before.

Target Customers

We use the information to identify the target group that will be able to use our service and this bus stop is at Benchakitti Park. From the above description of this area, the main location is Benchakitti Park, and the main nearest place is the Queen Sirikit National Convention Center. Our target group will be various types. Due to the high number of visitors this park receives, there is a chance for us to have many people use our service. It can be **teenagers, adults, or elderly persons that want to exercise, snap pictures, or just take in the pleasant ambiance of the park**. This is also a good trip for the family; however, they may drive their own car instead. Since the number of visitors to this park rises in 2022, our business will have more opportunities to let a larger number of consumers use our bus services. And it is open from 5 to 9 p.m. Since our buses start servicing passengers in the early morning and run until late at night, it is a match for this kind of person to pick up **any passengers who want to leave early in the morning or return late at night** from Benchakitti Park. For the NCC anticipated, there will be a lot of events when a gathering takes place in 2023. We can draw in a wider variety of customers to take our bus to attend events. Customers interested in attending the event in the Queen Sirikit National Convention Center include both **foreigners and Thais**, so this can promote us more to foreigners too.

From the article, during the period of economic inflation, it is not only increasing the cost of living but also the estates [13]. Sukhumvit road is the second prize and Phetchaburi Road is the fourth prize of becoming the popular location that people want to invest. As the information above, we think this would be a great location to make the bus stop because if people want to invest in this location, there are many places, restaurants, avenues, centrals, hotels, or attractions that can be built, and many people want to go travel around there. Therefore, it will be best for us to choose the bus stop at Emquartier and Phetchaburi Road.

Target Customers

The targets of the E-Bus at Emquartier and Phetchaburi Road are **the workers** because some companies provide parking lots for employees, <u>students</u> because of their school path, and tourists because the location is surrounded by many malls, hotels, and attractions.

1.2. Pain / Need

1.2.1. Payment:

The present buses have fewer approaches to pay because they have only cash and visa cards (some buses). The first problem is some passengers have only banknotes of high value, but the fare collector does not have enough money to change back. The second problem is in the peak time of the bus, the collector cannot collect payment from some passengers, then the passengers arrive at their destinations without paying their fares. In our point of view, it should be cashless in the future.

1.2.2. Technology:

At present, elders mostly do not use technology in many situations, but we now want our life to be a cashless society and think that the problem is the elders do not understand technology and think that it's hard for them. Therefore, what about we make it easy using technology?

1.2.3. Security:

In Thailand, it's not that safe because of thieves or criminals. We are concerned about our securities. If bad things happen to us, what can we do? How can we find the criminal? What about if it happens to the kids?

1.2.4. Pollution:

In this age, there are many kinds of pollution in Thailand, for instance, PM2.5 is critical, and it increases every day. Moreover, carbon dioxide from cars. Some buses still have no air conditioner and make people get the pollution directly. Even if they are waiting for the bus, they also get polluted besides the street.

1.2.5. Appearance:

The recent buses were used 30 years ago until now, so we think their appearance makes people feel uncomfortable using them. For example, the bus looks dirty, and people may think it can have a disease or think some accidents might have happened by the bus. Sometimes, there are people who don't want to use the bus because it looks old, and some

people want to look hi-so or civilized. Thai people who have medium-to-high financial standing want to look good and smart. Moreover, employees or certain groups choose not to use the bus service, partly because it reflects poorly on their image, so they do not want to use it and don't want people to see them use old buses. That reason makes us design buses to have a positive image, which is important to consider. If there are two buses that are functionally identical except that one of them looks better, a good-looking car will be a good choice for most people.

1.2.6. Concession:

The concession of the bus is one of the problems. This problem makes Thai people or foreigners get confused because there are many buses for some routes. Furthermore, private companies have a few buses to drive for passengers, so they use the peak time of the bus to gain passengers.

1.2.7. Global warming and climate change

Global warming and climate changes are concerned by people around the world nowadays or in the future, so we convince people to change our life by helping the world and fixing climate change. Because we think that if we use EV buses which means 100% electric power for our transportation, it is the proper way to solve this problem. From the EV survey, Krungsri researches, around 73% of people are interested in using EV-car because it is good for the environment [14]. Furthermore, we want to support people who have money in the middle class or higher to care about the world, the environment, and pollution.

1.2.8. Lack of route

Some routes are needed by many people but there's no bus working in that area. This situation is a problem that makes people must pay more to go to their desired destinations. We decided to add new bus routes. This will increase our revenue due to the high demand in transportation route.

1.3. Solution (Product/Services)

1.3.1. The overview of your solution

We designed the new look and new use of public buses to change the concept of the traditional public bus by incorporating technology inside the bus and developing a program to address the problem that people were experiencing. Passengers must register their palmprint and identify themselves before using the touchless scanning innovation on the bus. The way to register is to go to Bank or counter service that places scanning devices. Once enter the bus, scan the palm print with touchless technology through the scanner to pay for the fare. When exiting, the vehicle then performs another scan to checkpoint the location and calculate the fare. In the case that the passengers do not register in our system, this bus system allows QR-code for passengers. The transaction will happen via our application. In addition, it can top-up so that cash is not required. The application will link your scanned palm on the bus to the database in our bus system to access the wallet in your bus account. Passengers can also contact us and use our app to track the bus, which has more features to help them. This allows people to use the bus service comfortably and conveniently. The route of the bus we choose will depend on the targets. The area we consider will be the place that people who have an education, work, and high income live in, so the route will be in the city, such as Thonglor, The Customs Department, Central Rama 3, L&H Villa, Chong Nonsi, Thanita Plaza, Benchakitti Park, Phetchaburi,and Emquartier. The primary goal is to make the payment system cashless. All of these options can encourage Thai people and tourists to use the service, which will improve this industry.

1.3.2. The features of your solution and which pain that these features can solve.
<u>**Feature in Application**</u>

1. **Payment:** We implement the payment system within the app to enable users to top up their prepaid expenses on the bus. The payment in the application will link to your account that has been registered by the scanned palm technology. Passengers can still use the service even if they don't have money in their wallets in case, they already use our service at least 1 time, but they can only use it once. Passengers must top up their accounts after the notification of not having enough money. We also have the history of the transaction for passengers too. The

payment page in the app uses the same logic as the banking and food delivery apps. The issue of passengers who don't carry cash will be resolved by this.

2. **Number of available seats:** This feature seems simple, but that's one of the things we want to highlight. Passengers can decide whether they want to use this car by seeing the number of available seats. If they prefer not to ride in a crowded bus, they can use an alternative method that we've included in this app, which is the arrival time of the car that is closest to them.

3. **The nearest bus for the best path and arrival time:** Nowadays, it is difficult for foreigners to determine which bus refers to which location. As a result, tourists now use other transportation options instead of buses. This is a problem that affects not only foreigners but also Thai people. This is why we want to implement these features. Passengers can enter their source and destination, and the app will locate the bus that best fits their route. Passengers can use this to determine which bus to board. It will display the arrival time too. Most passengers use this type of transportation to get to work. That means one of our targets is the employee. If we add this feature, the workers who use this service will be better able to manage their time.

4. **Chat for feedback:** Feedback is very important to our startup technology, so we need to know all the concerns of the passenger and create a channel for them. Only then we can determine how to improve our features. We must ensure that every passenger understands how to utilize this service because some of the features are quite new to many individuals.

5. **Notification of your destination:** This feature is very interesting and very useful. If the passenger is sleeping or doesn't know the destination, they can acknowledge it from this notification, as it will send you the message that this is your destination which you mark it in the application. This will lead people to get off the bus without mistakes for the wrong place.

6. **Showing price [option]:** Customers can use this feature to prepare money in their wallets, so they don't have to worry about not having enough money to pay the fare in the case of people who set up the source and destination on the application.

<u>Bus</u>

- ▪ **Technology:**
  1. **Computer vision:** We use computer vision for payment by having passengers scan their palms to pay when entering and exiting the bus.
  2. **Deep learning:** Deep learning, which powers computer vision and trains algorithms to work on the program to correctly identify passengers,
  3. **AI weapon-scanning technology:** Weapon scanning is the technology that increases safety for passengers who come to use it. They can be sure that it reduces the risk of using weapons to cause physical harm.
  4. **EV car:** Make an electric vehicle to reduce smoke. Most Thai buses today are filthy and very old with long service life. Buses without air conditioning have been in service for 10 to 20 years, which has led to the engine malfunctioning and degrading to create soot. We use this as a solution to this and create an eco-friendly automobile.

- ▪ **Features:**
  1. **Free Wi-Fi:** Provide an extra service.
  2. **The luggage storage area:** This is for travelers or persons who carry a lot of luggage to store their bags, so it doesn't block the walkway.
  3. **Informing passengers of the next station's arrival time and location:** This helps them know where they are on the way. Passengers can prepare to get ready to exit the bus. Additionally, it shows the schedule in order to inform you of its arrival time. People who are unfamiliar with the path or can't remember the way would benefit greatly from this. Moreover, the display will include a voice that mentions the lactation when it arrives.
  4. **Appearance**
     - o **Stairs up low automobiles:** If the height of the steps is adjusted when getting in and out of the bus, older persons and kids can get in and out of the bus more easily.
     - o **Look:** Even if it's a little issue, the design must also take this into consideration. Another crucial factor is the bus's appearance. It had to be

contemporary and usable when we designed it. We love the look of the BTS, MRT, or the widely used bus in London and may have a design in that pattern. The itinerary display will be digital.

5. **A scanning weapon** helps to increase safety within the vehicle. When you enter the automobile, the scanning gadget we installed in the door will look for weapons.

6. **A scanning palm device** is what we design to process payments. This device will connect to the application to top up money in your account. When you board this electric bus, your palm must be scanned. Then, this equipment will compare your palm print to the palm you used to register to determine whether they are identical or not. Scanning your palm, will identify you and access your account. Before getting out of the car and scanning once again.

How can we become known?

By advertising this in public and on social media, you can encourage people to utilize it because it represents the modern bus transportation style. Our bus will initially be highly intriguing to people. As a result, it is anticipated that a client group of Thai people and foreign people will use it. People take an interest, just like the well-known buses in London. Once some time has passed, if our service is practical and effective, customers will come back and utilize it again.

1.4. Revenue Model

Our company's revenue model defines how businesses charge customers for products or services to generate revenue. The revenue model prioritises the most effective monetization methods based on what is offered and who pays.

Our Revenue Model Framework:

1.Who pays

      a. Customer or passenger paying to go by bus.

      b. Advertisers pay on platforms to reach audiences.

      c. Partners paying to work with our company. (E.g., EA Anywhere (charge power))

      d. Sponsors paying to host events with our company.

2. What is paid

      a. Money

      b. Other value generation such as data or insight.

3. For what is paid

      a. Transaction revenue (i.e., fee)

      b. Cost per Result

      c. Pay per use

4. How is paid

      a. Subscription per month/year

      b. Paid directly

5.How much is paid

      a. Fares vary depending on distance/ Dynamic Pricing

      b. Volume Discounts pricing

The types of revenue models that our company employs include such as transactional revenue, subscription revenue, advertising revenue, and sale revenue.

1. Transactional Revenue Model

How it works: Our business chose this model because our business sells products or services directly to customers (B2C), that is, customers will have to pay through palm print recognition or QR-Code on the bus.

2. Subscription Revenue Model

How it works: our company earns money in this way means that we will have regular payments. But there may be an additional option when applying for membership (within the app and pay) will receive special privileges in terms of expenses with buses. There may be coupons (discounts on buses) for members monthly or yearly.

3. Advertising revenue model

How it works: Advertisements may also come in the form of e-mail if the user of the Application has chosen whether to receive information via email. Another format may be to promote with a billboard or a sign on the buses to promote their product or service.

4. Sales revenue model

How it works: Our business has to sell products or souvenirs within the application to support our company to continue. For example, a keychain or souvenirs belonging to the company.

1.5. Others – The other matters we are concerned about. We consider the laws and concessions.

1.5.1. PDPA

In PDPA law there is some sensitive personal data called biometrics in that we must collect the passenger's palm print to pay [15], [16]. However, we also have a consent base to solve the problem of "freely given" by creating an alternative to get on the bus by scanning the QR code in the app to pay instead of using your palm print.

1.5.2. Funds

This technology has a high investment. Our business focuses on making long-term profits because the technology is expensive, and we want to control the fare that passengers must bear.

1.5.3. Concession

- GPS - Our application service has a detailed description of every bus. Even though the bus has the same number, there are differences in routes such as taking the expressway and not on the expressway. The weakness that we encounter from using applications that are available today. And it's become our competitive advantage [17].
  - Limitations of GPS tracking buses. Currently, in Thailand, there is GPS bus tracking only for BMTA.
  - Same car number but different routes, for example, taking the expressway and not on the expressway, In the application, there are no details.
- Route - When we came into the role of public bus service, there must be an auction of bus routes that respond to more users than the existing companies that exist today.

Currently, during the past year, 2022, the Department of Land Transport has begun to allow many private individuals who won the bidding route to enter the bus service instead of the BMTA, the state enterprise that provided the service. But for private companies that come in to provide service, the right to reduce fares for the elderly cannot be used in the new shared vehicles that come into service. The private sector chooses to run only during peak times which makes more profit than normal, but during the normal time when people wanted to use the service, there was no running.

2. Competitors of your business

    2.1. Thai Smile Bus

TSB (Thai Smile Bus) provides transportation services to passengers by EV-buses and application TSB GO [18], [19]. Initially, there are 9 paths for buses and each path has 7 years for route license. They provide advertising media services inside and outside of each bus and included in the application. From the information of the Bangkok Mass Transit Authority (BMTA), it illustrates that passenger of BMTA, around 4.3K people per day (2019), are not satisfied with the inefficiencies, the standards, and the qualities of buses and services. So, TSB develops the qualities of buses and services to make it more convenient, security, cleanliness, and friendly to the environment [20]. Moreover, they use technology to expand the alternative ways of payment, such as, Debit Card, Contactless, Apple Pay, Google pay, pay a contact (PayM), Direct Debit, Standing order, Immediate or future payment, Internal transfer, international payments, CHAPS, Cheque, and Banker's draft [21]. The TSB GO application gives information of place, status, and time of the buses.

Comparing to our business *in term of application*, E-bus provides more information of buses and routes, for example, passengers can check the bus and station which is near to them, the available seats in the bus and application computes distances and duration, and including the payment, passengers can pay by top-up money in our application if they are uncomfortable to pay by palm-scanning. *In terms of buses*, we also use EV-buses to service passengers but initially we will provide less routes because it uses an amount of money to make this happen. The routes we choose will be in cities around the working areas, education areas, or foreigners and tourists. Furthermore, passengers must get in the bus at the front door and get out at the back door for orderliness and fast. In E-Bus, we provide free WIFI for the passengers in case of a lack of internet. We provide a new technology to passengers which is palm-scanning to make it easy to use for elders. *In terms of security*, E-bus provides more safety because we have AI weapon-scanning technology at the door when passengers get in the bus, it will detect at that moment before they pay the fares.

2.2. Viabus

Viabus provides services in the format of application which can follow the buses in 70 cities in Thailand, for instance, buses, minibuses, BTS, boats, and passenger vans [22]. Passengers can find the status, place, and the number of buses for finding where the bus is near them and computing time using the appointment to the destination. This provides convenience to passengers who use public transportation because they can manage their time and plan their journeys well. Viabus decreases the risk of getting lost because it provides and checks directions for passengers [23]. Moreover, foreigners and tourists are comfortable using more public transportation because Viabus has an English version of the app.

Compared to our business *in terms of application*, Viabus gives more information on public transportation in many areas than E-bus, for example, BTS, minibus, boat, passenger van, etc. On the contrary, E-bus provides more conveniences, for example, showing available seats and paying by top-up in the application. Viabus and E-Bus both provide English versions of applications for foreigners.

2.3. Moovit

Moovit provides convenience to passengers who want to use public transportation, such as bus, BTS, bicycle, etc., but do not know how to go [24]. This will help passengers to plan their journeys and give them information in detail, diverse directions of public transportation which passengers want to choose, and calculated time of journey plan. The advantages are Moovit provides information in detail, provides diverse directions, provides real-time suggestions for journeys and provides notifications when passengers arrive at their designated station. On the other side, its disadvantages are GPS lack of accuracy sometimes, Moovit is available in Bangkok and metropolitan provinces, or even some buses do not have GPS.

Compared to our business *in terms of application*, E-bus provides more conveniences such as showing available seats and paying by top-up in the application, but we fewer directions to provide passengers than Moovit. Other services that E-bus and Moovit provide are quite similar. On the contrary, Moovit provides more information about public transportation than E-Bus, for example, BTS, bicycles, etc.

2.4. Rumbo

Rumbo provides complete and latest information on public transportations, for example, bus, speed boat, canal boat, BTS, minibus, etc., in format of an application [25]. Rumbo will collect the directions that passengers use often, and they can get the notifications. Rumbo has more than 1,000 routes of public transportation in Bangkok, so this can assure the passengers that they might not get lost because Rumbo tells the details of the direction until passengers arrive at their destinations. Moreover, Rumbo provides flash news to inform passengers about traffic accidents and risk situations to make sure that passengers will not take a risk on the road.

Compared to our business *in terms of application*, Rumbo provides more things about public transportation than E-Bus, for instance, flash news and risk situations, boat information, BTS, minibus, etc. On the contrary, Rumbo does not provide payment features in the application, but E-Bus does.

2.5. Nexpoint

Nexpoint provides many types of electric vehicles (EV), for example, EV-buses, and EV-minibuses, by using 100% electric power [26]. This is good for the environment because it decreases noise pollution by emitting less sound than a combustion engine, and it decreases air pollution by using EVs that use less fuel and make less Carbon dioxide, PM 2.5, and dust. Nexpoint develops an innovation called Intelligent Battery Management System to support controlling batteries efficiently, make it long-distance driving and make it long service life. The battery can be charged even if it is not low.

Compared to our business *in terms of buses*, there are quite similar, however, E-Bus provides more technology to help passengers more conveniences, for instance, using deep learning and computer vision to detect passengers as objects and to pay fares by palm-scanning in the front door and passengers can leave without paying when they arrive their destinations. Moreover, E-Bus provides free WIFI for the passengers in case of a lack of internet and provides wide space areas for passengers who have luggage. Significantly, E-Bus has AI weapon-scanning technology which provides security by checking the weapon at the front door while passengers get in the bus.

Compare Competitor

	IOS	Android	Website	Customer relationship	Bus tracking	Security in the buses and in the app	Convenient/easy to use	Pay through the application/ mobile banking	Calculate travel time
E-Bus	1	1	1	1	1	1	1	1	1
TSB Go	1	1	1	1	0	0	0	0	0
ViaBus	1	1	1	1	1	0	1	0	1
Moovit	1	1	1	1	1	0	0	0	0
Rumbo	0	1	1	0	1	0	0	0	0
NEX Point	0	0	1	0	0	0	0	0	0
BTS	1	1	1	0	0	0	1	0	0
BMTA	1	1	1	0	0	0	0	0	0

3. SWOT Analysis of our business

<u>Strength</u>

- Personnel with expertise and experience in bus operations.
    - There is a dedicated electric car research team.
    - Having the talented engineering teams
    - System software development team in applications to meet customer needs as much as possible.
- Our company is the first company in Thailand to import touchless technology for payment by hand palm.
- Connection: even though we are a new company. Our company is reliable because we have a clear target group. And target customer group market that is distinct from competitors. In addition, the selected group has financial power. Therefore, allowing us to create a connection with EA anywhere, we may join organizations related to electric vehicles and organizations that can work together in the future. Trick vehicles too, such as the hotel business. To be in the business area to expand connections in the future
- Loyal customers - As we are a public transport company, workers and students will use our service on a regular basis.
- Excellent Customer service - We have a channel where you can write feedback on applications or contact us via email if you have any concerns.
- Technology Innovations - We implement an unusual touchless payment method. An innovation in computer vision technology is used to create a scanned palm machine for payment purposes. Since no one has done this method of payment on buses before, it gives us a huge advantage. People will be drawn in by this to marvel at the brand-new technology they have never seen before in Thailand. Additionally, this can demonstrate the potential of our company to attract investors who will help in our business expansion. Our main strategy is to make payment easy and hassle-free.
- Best software applications - We have many unique features that are provided to customers, and we are. It is usable and beneficial to customers.

Opportunity

- In Thailand, there were 17,026 total EV registrations as of the end of 2022, a growth of 118.79% from 2021 [27]. According to statistics from 2021, Thai consumers choose to drive electric cars for three primary reasons: cheaper running expenses (81%), being environmentally friendly (73%), and is interested in new technology (59%) [14]. Given the data, it can be assumed that Thais are becoming increasingly environmentally conscious and interested in utilizing electric automobiles. It predicted that in the next three years, more people who use public transportation will prefer to use EV buses instead of buses that run on gasoline with emitted black smoke. This gives us the big chance to promote our EV buses to be the leader of the electric bus industry that provides the best service. It will be one of the options for customers to use our public transportation service. Because we started before the industry became popular. Therefore, we can be leaders in this field in the future.

- **Government Support EV Cars:** Governments in each country have policies to support the production of electric cars, including using more electric cars to reduce the emission of toxic car exhaust gasses into the air. Thailand is now paying more attention to EVs because of this national trend. This has led the government in Thailand to promote investment in EV operators, preparing a 0% tax reduction to drive EV production in Thailand [28]. Our company has received good results in reducing costs in this expense because our cars are produced locally and therefore do not pay import duties between 20-40%.

- **Oil Price in the Global Market:** The oil price outlook on the world market in 2023 has been adjusted down due to the global economic recession [29]. However, the demand for oil is higher than the amount produced, so it is expected that the price of oil will increase towards the end of the year. Thailand has imported up to 90 percent of its oil and the other ten percent of its own products. Thailand imports crude oil from Middle Eastern sources, where Dubai crude is the reference price for nearly half of its total crude volume [30]. As a result, the oil price in Thailand is also affected by oil prices in the world market. However, the drop in global oil prices did not immediately affect Thai prices. Because there are many factors, such as money, and various tax costs that affect the business of vehicles powered by fuel must be affected by this [31]. Buses reduced their running and gradually closed

their businesses due to expensive oil. It is likely that in the future these buses will have to be canceled because of high fuel prices and various vehicle repair costs. It is a good chance to let people come and choose our buses instead.

- **Depletion of oil resources:** rising oil prices and decreasing oil supply will be factors that encourage the exploration and development of renewable energy resulting in various technologies, such as electric vehicles [32], [33]. To make electric cars that will replace existing fuel cars, manufacturers must add other technologies to make the cars have different and modern functions. From the above information makes us a by-product of the technology that they created and let us apply it to our bus. Like our buses, we choose to use renewable energy and provide different technologies from others to solve bus problems in Thailand. This will make us more new technology from this change and make buses beneficial.

- **Cheap for charging energy** - From comparing the energy cost per kilometer.

• **type of car**	• **Price per kilometer**
• Electric cars	• 0.37 baht/km
• Gasoline vehicles	• 1.76 baht/km
• hybrid car	• 1.25 baht/km

As can be seen, the cost of electric vehicles is significantly lower than that of gasoline. The average energy value of gasoline or diesel is approximately 30-40 baht per liter [34]. Therefore, our bus has energy costs for driving at a lower price than other types of buses.

- **Expanding Electric Vehicle charging points (EA ANYWHERE)** - Now that there are many electric vehicle charging stations in Thailand, EA ANYWHERE is one of the first and has more charging stations available for 1,000 locations nationwide [35], [36], [37].

Since we don't have our own filling point. Therefore, it is good that in Thailand there are more and more electric filling points.

- **Rents in Bangkok are more expensive** – This causes people in Bangkok to make it necessary to save the budget, so we are the right solution [38]. Because our cars have a good image, and the price is low, suitable for the service to serve customers.

Weakness

- **Limited Advertisement:** For foreigners, our bus and application are difficult to be known. To promote, we primarily advertise in Thailand. Unless foreigners who visit the city in Thailand see our buses on the road or through billboards, they will not know that we are there. However, we believe that these disadvantages can fill this loophole using social media by Thai people. Since we are a new type of bus that is not yet available in Thailand, we will be able to attract people and get reviews from real users on social media, which is a way to promote us without incurring any expense. There may also be news releases due to interest in modern technology on our buses, both in Thailand and abroad. These may be substitutes for advertising results on foreign platforms to make foreigners known. And after that, it will be known through word of mouth.

- **Honestly**: The way we scan for payment when entering and exiting the bus is one by one, so we need people to be honest with us. If they are not honest, that means they didn't pay for their fare, which will affect our income. This is based on conscience and awareness of honesty which is something that we uncontrol. It depends on the environment of that person and the society they live in.

- **Charging Time**: The time to charge the buses is 35 minutes, as we use a battery of 170 kWh, so it takes a lot longer to get a full charge when compared with a petrol bus [42]. Our buses have a range of 90 km per charge, so we need to charge during the day. Because the route that we will drive is 25 km per 1 lap. We can drive at most three laps, so it will be 75 km excluding traffic jams, causing our electricity to be reduced further. Then we must stop for charging because we have power that can run 90 km, which we will charge at the EA station.

- **Maintaining Battery**: We must pay for the maintenance of EV buses because electric bus batteries have an average lifespan of 7-9 years, and each charge is used to charge the battery until it is fully charged [43]. As a result, we could extend the service life to nine years, but we would still have to pay extra.

- **Registering for a Palm-scanned device**: This is our weakness because to use the palm-scanned device on the bus, the passenger must go register at a bank or counter service that places it; otherwise, they have to scan a QR code for payment instead. Some people may not have time to go for registration.

- **Lack of experience in marketing commercial vehicles** – When comparing our experience to others, we are lacking because we are a start-up company.

Threat

- **Low GDP in Thailand:** GDP is a measure of the income generated within a country. Since the GDP in Thailand is low compared to other countries, it shows that the turnover in the Thai economy is not good [39]. It can be inferred that people may not have jobs, resulting in no income to spend on goods and services, or have low incomes. This shows that some groups of people will not take our buses. The reason is that our buses are slightly more expensive than the original buses because they can't afford them. It doesn't meet their needs. This makes our target base smaller and more specific to people with medium-to-high incomes. Thailand has a GDP per capita of 244,944 baht per year. But there are only 500,000–1 million people using buses per day [40]. Compared to Singapore, which has a GDP of 2,010,828 baht per capita per year. There are 3.9 million people using buses per day. It shows that it's not only a salary problem but there are other factors that make Thai people not use buses.

- **Bangkok's Minimum Wage:** Bangkok's minimum wage is 353 baht, which is around $10,000$ baht per month [41]. And statistics show that more than 42 percent of public and private employees are underpaid $10,000$ per month. Monthly expenses that a person who has a job is responsible for include paying for accommodation, water, electricity, food, etc.,

resulting in 1000 real baht left. If they must travel every day, it's 33 baht per day. They can pay for the car up to or from 15 baht per trip, which means they will not have any savings from the above. It shows that many people do not have enough money to pay for convenience.

Opportunity Canvas

Value	Whom
- Not enough payment option - Encourages elders to use technology - Bad bus security - Bus engine causes pollution - Bus looks uncomfortable and unsafe - Many buses for route causes confusion - No bus for some routes	- Company workers - Public transport users - People who can't drive/don't have a vehicle - People who want comfort on public transportation - People who don't like waiting - People who like paying with mobile applications. - Foreigners and tourists
Solution	**Unfair Advantage**
- Incorporate technology into a bus (Palmprint scanner) - Develop an app for paying bus fee - Develop an app for tracking buses - Implementing more bus seats	- Bus fare calculator - Top-up feature - Palm print recognition

4. Business Model Canvas of your business with the explanation of each canvas element and their relationship.

KEY PARTNERS	KEY ACTIVITIES	VALUE PROPOSITIONS	CUSTOMER RELATIONSHIPS	CUSTOMER SEGMENTS

● Payment provider
● Bank
● Advertising company
● Bus manufacturing company
● Electric provider
● Map API providers
● Technology providers (In terms of buy technology)
	● Driver training
	● Vehicle maintenance management
	● Vehicle operation management system
	● Data gathering
	● Data analysis
	● Platform development (Mobile applications)
	● IT operation
	● Personal Data Protection Policy
	● Develop a technology to be faster when scanning palm print
		For passengers:
		● The new image of bus public transport
		● Reduce air pollution with electric vehicle
		● Bring fast passengers transport services with reasonable prices
		● Passengers use the service in a safe and clean environment
		● Cashless society
		● GPS tracking system by which passengers will get to about the bus's current situation
		● The status of the available number of seats on the bus
		● Free Wi-fi
		● Experience a new way of using technology to pay with the palm of your hand on the bus
		● Functional applications responding to all bus services (E.g., Bus status on the road, Available seat, Suggest the best route for your destination)
			Personal assistance:
			● Responding to customers via chat application
			● Registration policies that apply to customers
			● Palm registration point according to banks
			● A better travel experiences
			● Promotion for advertisers' company
			● Advertising on application / Web
			● Bus billboard promotion for 3 / 6 / 12 months
			
			Auto service:
			● Chatbot gather problems and solutions obtained from talking to customers
			* Provide customers with assistance guidelines to help reduce queue times and speed up service.
			● Accurate data
			● Rich and real-time set of data that help passengers plan the best route
				● People
				  - Worker (at BKK) 25-50 years: can't drive, drunk, no license
				  - Student 13-24 years
				  - Foreigner
				
				● Advertisers, Ad Agencies

	KEY RESOURCES ● Investment ● Developer ● EV Bus ● Management team ● Customer support center ● IT infrastructure ● Skilled drivers ● **Lawyer**	● Luggage storage on the bus ● The screen shows the route on the bus. Both Thai and English ● Voice prompts when arriving at each stop ● Passenger safety with weapon scanners For customers who are businesses: ● Providing advertising services with reasonable prices and efficiency	**CHANNELS** Online: ● Application-based communication ● Apple iTunes App Store ● Google Play App store ● E - Bus YouTube channel ● Email Offline: ● Register palm print at bank ● Hotlines	

COST STRUCTURE	REVENUE STREAMS
● The cost of purchasing technology, making the bus palm print payment technology is the most important cost inherent in our EV bus service ● Technological infrastructure ● Vehicle electric ● Customers support ● Palm print register station construction ● Product development ● AWS infrastructure ● Development of proprietary software ● Data acquisition – Crowdsourcing helps to reduce costs ● Maintenance	● Passengers fare on per Km basis ● Subscription fee ● Revenue from advertising: base on the time and number of buses use for advertising ● E-bus application is available for free ● Advertising on the application / website ● Payment fee (E.g., Visa, MasterCard)

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