Road freight transportation business operator’s perception toward electric vehicle adoption in Nakhon Pathom, Thailand

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Abstract. This research aims to observe Road Freight Transportation Business and examine Road Freight Transportation Business Operator’s Perception toward Electric Vehicle Adoption in Nakhon Pathom, Thailand. This research applies purposive sampling; 35 entrepreneurs with a minimum 3-year experience operating small and medium enterprises in Nakhon Pathom during January, 2022. The researchers collect information using in-depth interviews and analyze information by content analysis. Most respondents agree that electric vehicles are not appropriate for the transportation business today. Some state that electric vehicles may be appropriate for local transportation or in-house operation. The possibility of investing in electric vehicles is directly related to technology-related infrastructure, which in today’s economy, is challenging to invest in by small or medium-sized businesses. The growth direction of electric vehicles for transport businesses in Thailand will grow gradually as electric vehicles enter the market in Thailand. Adopting Electric vehicle technologies for transportation business in Nakhon Pathom related to Electric vehicle infrastructure development which relies on government or large private company investments. Keywords: electric vehicles, freight transportation, Thailand.

1 Introduction

Thailand is home to a vast highway network that connects each region of the country, and through regional integration, Thailand is becoming a hub of regional road transportation. Road freight transport is defined as road transport between two places (a place of loading and a place of unloading) located in the same country by a vehicle registered in that country.(ec.europa.eu, 2021), has a vital role in freight transportation across Thailand, accounts for 79.7% of all goods moved within Thailand (data as of 2020)(Sathapongpakdee, Piyanuch, 2022).

Over 2022-2024, the road freight transport industry is expected to enjoy growth rates of 3-5% per year. The industry will benefit from growth in manufacturing and trade, the increase in public-sector spending on infrastructure construction, and the likely expansion in

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agricultural outputs (Sathapongpakdee, 2022).

As of December 2021, there were approximately 820.4 thousand private trucks in Thailand, of which the majority were used in the provincial area. In that same period, private pickup trucks accounted for the majority of the private trucks in the country (Manakitsomboon, 2022).

<table>
<thead>
<tr>
<th>Year</th>
<th>Truck operators</th>
<th>Shipping companies</th>
<th>Warehouse Company</th>
<th>Public bus operators</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>24,922</td>
<td>4,111</td>
<td>785</td>
<td>1,515</td>
</tr>
<tr>
<td>2018</td>
<td>28,700</td>
<td>4,535</td>
<td>784</td>
<td>1,527</td>
</tr>
<tr>
<td>2019</td>
<td>32,310</td>
<td>5,259</td>
<td>801</td>
<td>1,515</td>
</tr>
<tr>
<td>2020</td>
<td>35,269</td>
<td>5,952</td>
<td>817</td>
<td>1,503</td>
</tr>
<tr>
<td>2021</td>
<td>37,866</td>
<td>6,878</td>
<td>860</td>
<td>1,470</td>
</tr>
</tbody>
</table>

According to Table 1, small and medium business truck operators significantly increase yearly.

Today, electric vehicles are one of the significant shifts in the transport industry. Electric cars are becoming more affordable and efficient, and the infrastructure for charging them is improving. Electric cars will play an increasingly important role in the automotive market in the years to come (Sattayathamrongthian & Vanpetch, 2022). Globally, electric vehicles (EVs) are rapidly increasing. Growth in the Thai automotive market is expected to maintain momentum throughout the year, with electric vehicle (EV) sales projected to expand by 15-20%, according to the latest estimate from the organizer of the Thailand International Motor Expo (Lamonphet Apisitniran, 2022).

Nakhon Pathom Province is an important economic centre of the country. The gross provincial product (GPP) value at the 2018 price equals 349,066 million baht, an increase from 2017 worth 329,508 million baht, equal to 19,558 million baht, accounting for 2.13% of the total product value. Country (GDP) (Nakhon Pathom Provincial Industrial Office, 2021).

Innovations and technology have played a big part in the recent economic growth in Thailand. Businesses of all kinds are facing immense challenges to adapt to the latest developments, which will continue to impact every business sector over the next decade.

Most business operators have good technology literacy and resources, but contexts may lead to different technology adoption with different conditions and business conditions. Even age or experience is not related to new transportation technology adoption.

This research aims to examine the feasibility of adopting and implementing electric vehicles for small and medium road freight transportation businesses in Bangkok, Thailand.

1.1 Research Question

What is the Road Freight Transportation Business Operator’s Perception toward Electric Vehicle Adoption in Nakhon Pathom, Thailand?

1.2 Research Objectives

- To observe the Road Freight Transportation Business Operator in Nakhon Pathom, Thailand.
- To examine Road Freight Transportation Business Operator’s Perception toward Electric Vehicle Adoption in Nakhon Pathom, Thailand.
2 Literature Review

2.1 EV adoption in Thailand

Improved government incentives and the entry of new market players offering more choices to customers are the key factors accelerating market adoption of fully electric vehicles (EV) in Thailand. But despite a positive start to 2022, The Thai government has set ambitious targets to have EVs account for 100% of vehicles sold and 50% of vehicles produced in Thailand by 2035 (ABeam Consulting, Press Release, 2022).

Better EV infrastructure is the key to encouraging Thai motorists to choose EVs over petrol vehicles. Most consumers understand the benefits of transitioning to EVs but are discouraged by the lack of charging stations as well as incentives.

An improvement in Thailand’s EV policy to widen the country’s charging network, especially outside of Bangkok, is crucial to increase EV adoption (https://www.marketresearchsoutheastasia.com/, 2022). Various factors influencing electric vehicle purchase intention, including car performance, psychological and social status, government policies, cost, environmental concerns, and infrastructure (Yang et al., 2020).

2.2 Theory of planned behaviour (TPB)

The theory of planned behaviour is counted among the influential works in the psychology domain. It has often been used to investigate consumers' behavioural predispositions and buying behaviour (Bamberg, 2007).

An attitude refers to emotions, beliefs, and behaviours toward a particular object, person, or event. Attitudes are often the result of experience or upbringing. They can influence behaviour and affect how people act in various situations (Susman, 2022).

Attitude is a favourable or unfavourable evaluation of acceptance behaviour (Ajzen, 2005).

Attitude toward an innovative technology or new product is the key predictor of their intention to adopt such technology (Ajzen, 2008; Wang, 2018). Therefore, attitude is essential in understanding and predicting future behaviour related to this technology.

2.3 Knowledge

Knowledge refers to understanding or information about a subject individual gets through experience or study known by one person (cambridge.org, 2022). Knowledge and attitude are related. Most participants had research knowledge and expressed a positive attitude toward involvement in research activity (Basavareddy, 2019).

Social influence refers to the demands of a social environment that significantly affect individuals to change their behaviour. It involves intentional and unintentional efforts to change another person's beliefs, attitudes, or behaviour (Gass, 2015). For example, the adoption of innovative technology is a result of getting appreciation from others (Sovacool, 2017).

Environmental concerns refer to the awareness of an environmental problem that may change individual behaviour to have minimal impact on the environment. For example, environmental concern and knowledge significantly impact the willingness to purchase green products among young consumers in developing countries(Yadav & Pathak, 2016).
2.4 Subjective norm

Subjective Norm refers to the behaviour of an individual related to someone important, engaged in that behaviour, or wanting him to do so; the individual will be more likely to be amenable to it. The reference group significantly influences consumers' intentions to buy hydrogen fuel cell electric vehicles (Al-Amin, 2016), the reference group will significantly impact buying intentions after consumers have test-driven (Schmalfuß, 2017).

2.5 Perceived Behavioural Control

Perceived Behavioral Control may refer to behavior related to believing that an individual can perform the behavior in that situation and control it to the intended effect; then, he is more likely to suppress that behavior.

The financial benefits are also related to the value of the price. Electric vehicle price refers to the amount to be paid or compensation given to another person in exchange for goods or, according to research (Degirmencio, 2017); value for money is the fact that consumers compare the money they have lost to what they receive.

Once driven, the concept of reasonable mileage and adequate range and charging for fuel-efficient vehicles can be exhausted. It can be refilled at a typical service station, but today's battery-type electric vehicles are charging. The power is also quite limited, as the volume of electric vehicle charging stations has yet to be dispersed. The dots are basically like service stations. As a result, knowing the maximum running distance of the vehicle and the location of the charging station is an essential factor that consumers need to be aware of.

3 Research Method

The researchers apply the qualitative research method to explore the disparate experiences of a group of business operators and describe how they addressed their business challenges. The researcher team utilizes small samples to address the complexity of the entrepreneurship development issue by focusing on the people with relevant experience and expertise. According to the Delphi technique, if various reference groups are involved in research, more subjects are needed and usually recommended for samples of more than participants (Giannarou L, 2014).

This research applies purposive sampling; 35 entrepreneurs with a minimum 3-year experience operating small and medium enterprises in Nakhon Pathom during January, 2022. The researchers collect information using in-depth interviews and analyze information by content analysis.

The participants who agreed to an interview were the primary analysis data and gave informed consent. The informed consent included: (a) the interviewee was informed of their rights as a research participant, (b) the participant could withdraw their consent at any time, and (c) they could refuse to answer any particular questions.

<p>| Table 2. Research Respondents (n = 35). |
|-----------------|-----------------|-----------------|
| <strong>Gender</strong>      | <strong>Frequency</strong>   | <strong>Percent</strong>     |
| Female          | 19              | 54.28           |
| Male            | 16              | 45.72           |
| <strong>Age</strong>         | <strong>Frequency</strong>   | <strong>Percent</strong>     |
| Between 16-30   | 6               | 17.14           |
| Between 31-45   | 21              | 60              |
| Between 46-60   | 4               | 11.43           |
| 61 and above    | 4               | 11.43           |
| <strong>Education</strong>   | <strong>Frequency</strong>   | <strong>Percent</strong>     |
| Vocational school | 10             | 28.57           |</p>
<table>
<thead>
<tr>
<th>Total Freight vehicles</th>
<th>Bachelor degree</th>
<th>20</th>
<th>57.14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master degree</td>
<td>5</td>
<td></td>
<td>14.28</td>
</tr>
<tr>
<td>Between 1-10 vehicles</td>
<td>8</td>
<td></td>
<td>22.86</td>
</tr>
<tr>
<td>Between 11-30 vehicles</td>
<td>17</td>
<td></td>
<td>48.57</td>
</tr>
<tr>
<td>More than 30 vehicles</td>
<td>10</td>
<td></td>
<td>28.57</td>
</tr>
<tr>
<td>Size of Business (Employee)</td>
<td>Micro enterprises (fewer than ten employees),</td>
<td>6</td>
<td>17.14</td>
</tr>
<tr>
<td></td>
<td>Small enterprises (10 to 49 employees),</td>
<td>21</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>Medium-sized enterprises (50 to 249 employees),</td>
<td>8</td>
<td>22.86</td>
</tr>
<tr>
<td>Size of Business (average income)</td>
<td>Less than 1.8 million baht/per year</td>
<td>6</td>
<td>17.14</td>
</tr>
<tr>
<td></td>
<td>Between 1.8 million-30 million baht/per year</td>
<td>10</td>
<td>28.57</td>
</tr>
<tr>
<td></td>
<td>More than 30 million baht/per year</td>
<td>19</td>
<td>54.28</td>
</tr>
<tr>
<td>Year of operating</td>
<td>Between 5-12 operating-year</td>
<td>16</td>
<td>45.71</td>
</tr>
<tr>
<td></td>
<td>Between 13-20 operating-year</td>
<td>8</td>
<td>22.85</td>
</tr>
<tr>
<td></td>
<td>More than 21 operating-year</td>
<td>11</td>
<td>31.42</td>
</tr>
</tbody>
</table>

4 Research Result

Most of the respondents are female, aged between 31-45, and have a bachelor's degree educational background. Most of them are sole proprietorships, freight vehicles between 11-30 vehicles, and 10 to 49 employees, with an average income of more than 30 million baht/year with 5-12 operating-year.

All respondents are business operators' head offices in Nakhon Pathom, Thailand.

Based on the primary data and information from transportation business operators, the road transportation business can be categorized into three sectors: transportation operations are the primary business operations, transportation operations are the supporting activities of the business, and freelance operators.

1. Transportation operations are the primary business operations.

The business provides transportation services from the agreed pickup point to the drop-off point at the agreed location. The business obtains essential resources such as vehicles, drivers, support facilities, service, and administration teams. In the busy time, they also hire freelance drivers or other private transportation businesses to fulfill the order from the customer.

2. Transportation operations are the supporting activities of the business. It refers to a segment in a business that provides transportation of goods from a warehouse to a delivery point at an agreed location, such as transportation from a distribution centre to convenience stores.

Most businesses related to production or trading usually have transportation to facilitate customers. The business usually has a certain level of in-house transportation and will consider hiring an external private transport vehicle to fulfill the order from the customer. The transportation segment's size depends on the primary business's size and the area of operation.

3. Freelance refers to a person or business that uses a private vehicle as a freight car and carries out transportation work as hired by the customer according to the agreement or receives transportation work from another private transportation business. Getting a transport job is a freelance job that offers higher benefits based solely on performance. However, earnings rely on short-term agreements and accept the depreciation incurred risk of accidents, and other expenses.

Most vehicles used in transportation are vans, medium-sized pickups with engine capacity between 1500cc – 3500 cc, six-wheeled transport vehicles, and ten-wheeled transport vehicles.
The vehicles commonly used among transportation operators are divided into two groups:

1.1 Regular pickup truck. Toyota and Isuzu pickups are the preferred choices among business operators.

1.2 Six-wheel trucks to ten-wheel trucks. Hino and Isuzu are the preferred choices among business operators.

The main reasons are durability, easy maintenance, affordable spare parts, and reasonable resale prices, as there are still used truck market segments.

One respondent stated that there used to be a car from a new foreign company to market in Thailand, but it was unsuccessful because it could not compete in such matters. Among entrepreneurs, there is also a fair amount of networking between them. There will be an introduction among operators to the pros and cons, which most operators still prefer to use the same group of transport vehicles. Some respondents who choose to invest in gas-powered vehicles stated that they could save a lot on transportation costs but are also stuck with limitations in some areas where it may be challenging to find gas-filling points.

Some operators have suggested that the performance of gas-powered vehicles cannot compete with diesel-powered vehicles considering the performance.

### 4.1 Knowledge and experience related to electric vehicles

Most respondents have a basic understanding of electric vehicles. Some respondents have relevant experience and own an electric vehicle. They comprehend the benefits of using electric vehicles and express opinions and demands for electric-powered transport vehicles: Vehicle performance should be comparable to or better than today's transport vehicles and reasonable price levels than commercial vehicles. Currently, electric vehicles still have many limitations, such as charging locations and maintenance that support electric vehicle technology still need to be improved. For example, there currently needs to be more garages or electric vehicle repair technicians. Spare parts must be imported from abroad. One respondent stated that one car insurance company does not cover car batteries.

### 4.2 Social factors

Most respondents consider that social factors slightly influence investing in electric vehicles. Suppose a business or local operator chooses to use electric vehicles; they may observe more about their current pros and cons. However, social factors are not the leading reasons for deciding on electric vehicles.

### 4.3 Environmental Concerns

Most respondents are aware of environmental issues but also agree that environmental factors have very little influence on their decision to invest in electric vehicles instead of current transport vehicles.

One respondent stated that the medium or large transportation business might require following environmental regulations.

### 4.4 Attitude

Most respondents have a positive attitude toward electric vehicles, however, there are still a number of constraints that make it impossible to invest in electric vehicles. They follow up on relevant information and feasibility for future investment in electric vehicles.
4.5 Subject Norm

Most respondents stated that if a partner in the transportation business, a shareholder, or someone related to them supports investing in electric vehicles, they are also likely to invest. However, nowadays, they do not support the idea of investing in electric vehicles.

4.6 Financial Benefit

Most respondents stated that the return on investment is the primary issue related to the decision to invest in electric vehicles.

Most respondents agree that electric vehicles are not appropriate for the transportation business today. Some state that electric vehicles may be appropriate for local transportation or in-house operation. The possibility of investing in electric vehicles is directly related to technology-related infrastructure, which in today’s economy, is challenging to invest in by small or medium-sized businesses. The growth direction of electric vehicles for transport businesses in Thailand will grow gradually as electric vehicles enter the market in Thailand.

The development of electric vehicles supported infrastructures depend on government policy or large private company investments.

5 Conclusion

As the data has shown, modern technology may not be the right approach for businesses. Transportation business in Nakhon Pathom province are also limited in investing in new technologies.

6 Limitations and Future recommendations

This research aims to collect data from small and medium-sized enterprises in Nakhon Pathom province only. The research team recommends that the information be distributed to other local operators, including large business representatives or public companies, representatives of car operators, which may bring clear information on the future of the electric vehicle business in Thailand.

Acknowledgments

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