

**THE ATTITUDE AND TECHNOLOGY RESISTANCE TOWARDS
AUTONOMOUS VEHICLE ACCEPTANCE IN THAILAND**



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AUTONOMOUS VEHICLE ACCEPTANCE IN THAILAND**

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CONTENTS

	Page
ACKNOWLEDGEMENTS	ii
ABSTRACT	iii
LIST OF TABLES	vii
LIST OF FIGURES	viii
CHAPTER I INTRODUCTION	1
1.1 Background	1
1.2 Problem Statement	2
1.3 Research Question	4
1.4 Research Objective	5
1.5 Research Scope	5
CHAPTER II LITERATURE REVIEW	6
2.1 Autonomous Vehicle	6
2.2 Autonomous Truck (Driverless Truck or Auto-Driving Truck)	7
2.2.1 Perceived Usefulness	7
2.2.2 Perceived Ease of Use	9
2.2.3 Trust	9
2.2.4 Social Influence	10
2.2.5 Attitude	10
2.2.6 Perceived Risk	10
2.2.7 Resistance to Change	11
2.2.8 Autonomous Truck Acceptance	13
2.3 Existing Reference Framework	13
2.3.1 TAM Model	13
2.3.2 Extended from TAM Model	14
CHAPTER III RESEARCH METHODOLOGY	15
3.1 Data Source	15
3.1.1 Target Population	15

CONTENTS (cont.)

	Page
3.1.2 Sampling Method	15
3.1.3 Sample Size	15
3.2 Data Collection	16
3.2.1 Sample Survey Research	16
3.2.3 Preparation for the survey	16
3.3 Data Measurement	16
3.4 Data Analysis	20
CHAPTER IV RESEARCH FINDING AND ANALYSIS	21
4.1 Frequency Distribution	21
4.2 Descriptive Statistic	24
4.3 Reliability Analysis	24
4.4 Cross tabulation and interpretation	25
4.4.1 The relationship between autonomous vehicle acceptance (APA) and gender	25
4.4.2 The relationship between autonomous vehicle acceptance (APA) and media channel	27
4.5 Path Analysis	29
4.5.1 Test of the proposed model	29
4.6 Correlation Coefficients with Spearman method	30
4.7 Covariance structure (Path Analysis)	31
4.7.1 Standardized Estimates	32
4.7.2 Descriptive Statistic and Correlation Matrix	33
4.7.3 Standardized Direct Effects and interpretation	35
4.7.4 Standardized Indirect Effects and interpretation	35
4.7.5 Standardized Total Effects and interpretation	36
CHAPTER V CONCLUSION AND RECOMMENDATION	37
5.1 Discussion of research finding	37
5.2 Limitation and Suggestions	38

CONTENTS (cont.)

	Page
5.2.1 Scope of Study	38
5.2.2 Population and demographic profile of the respondent	38
5.2.3 Implication for future research project	38
5.3 Recommendation	39
5.3.1 Recommendation for Attitude	39
5.3.2 Recommendation for Resistance to Change	39
5.4 Conclusion	40
REFERENCES	41
APPENDICES	43
Appendix A: Quantitative Questionnaire Items	44
BIOGRAPHY	49

LIST OF FIGURES

Figure	Page
1.1 Using 5G networks to connect with everything	1
1.2 Reason for bad working conditions among truck drivers across India	3
1.3 The increasing number of truck drivers from the year 2012 to the year 2026	3
1.4 Share of the population older than 65 in Thailand from 2015 to 2055	4
2.1 Technology Acceptance Model (TAM) developed by Davis (1989)	14
2.2 Extended model from Technology Acceptance Model (TAM)	14
3.1 Example of questionnaire format	17
4.1 Genders	22
4.2 Age	22
4.3 Education	23
4.4 Income	23
4.5 Media Channel	23
4.6 The correlation weight (Extended conceptual model from TAM)	29
4.7 The result of estimate standardized regression weight	31

LIST OF TABLES

Table	Page
3.1 Data Scale and Measured Technique on Each variable in Part A	18
3.2 Data Scale and Measured Technique on Each variable in Part B	20
4.1 Descriptive Statistics	24
4.2 Reliability statistic	25
4.3 Crosstabulation on gender and AVA, Question 1	25
4.4 Crosstabulation on gender and AVA, Question 2	26
4.5 Crosstabulation on gender and AVA, Question 3	26
4.6 Crosstabulation on gender and AVA, Question 4	27
4.7 Crosstabulation on Media channel and AVA	28
4.8 Correlation coefficient with Spearman method	30
4.9 Measure of model fit	31
4.10 Standardized Regression Weights	32
4.11 Unstandardized Regression Weights	33
4.12 Estimates of covariances among exogenous variables.	33
4.13 Descriptive statistic and correlation matrix	34
4.14 Standardized Direct Effects	35
4.15 Standardized Indirect Effects	35
4.16 Standardized Total Effects	36

CHAPTER I

INTRODUCTION

1.1 Background

Evolution in technological brings intelligent connectivity combination of the 5G, artificial intelligence (AI), and Internet of Things (IoT), to escalate technological development and enable new digital services. Before handling the user to fulfill the interaction between people and the surrounding environment, it uses to collect the digital information to make up IoT by using devices, machines, and sensors and analyzed and contextualized by AI technologies (Pasqua, 2019).

As the world never stop developing, 5G represent the missing pieces to bring the new level of technologies and enable the intelligent connectivity vision. New transformational capability may impact on the way of living, society, and industry sector. As 5G unified connectivity can be link with many things such as vehicle-to-network, vehicle-to-vehicle, vehicle-to-pedestrian, and vehicle-to-infrastructure. The major role that intelligent connectivity wants to focus on which are industrial and manufacturing operations, healthcare, public safety, and other sectors especially for transportation and logistics.



Figure 1.1 Using 5G networks to connect with everything (Source: Qualcomm)

The major role that intelligent connectivity wants to focus on which are industrial and manufacturing operations, healthcare, public safety, and other sectors especially for transportation and logistics.

An autonomous vehicle is one of the products from these combinations that bring many advantages to the user such as reduced emission, decreased number of road injuries, and less traffic. As this technology becomes more realistic, there are many truck companies interesting and trying to invent and develop their product to go along with the world evolution such as Volvo, Scania, Daimler, and Tesla. Moreover, some truck companies especially Daimler have tested their product as they get approval to drive on the public roads in Nevada, The United States.

They claim that autonomous truck can reduce:

- The burden of long-haul trucks causes the fatigue of drivers.
- The Congestion, maintenance costs, emission vehicle downtime, and fuel consumption by four to seven percent.
- May change insurance policy and its rate
- Reduce poor infrastructure or human fallibility.

1.2 Problem Statement

From Heinrich's triangle theory about explaining the majority reason for occurring the accident that came from fatigue, uses a mobile phone, eating and look something at the back seat. If there are 2 million drivers doing this activity while driving, it leads 240,000 of near misses, 20,000 of minor injuries, 400 lost times injuries, and 1 fatality (Songsakul, 2018).

This graph showing the reasons for bad working conditions among truck drivers in India and I believe that it also occurs in Thailand and it may lead to the shortage of truck drivers for over the world.

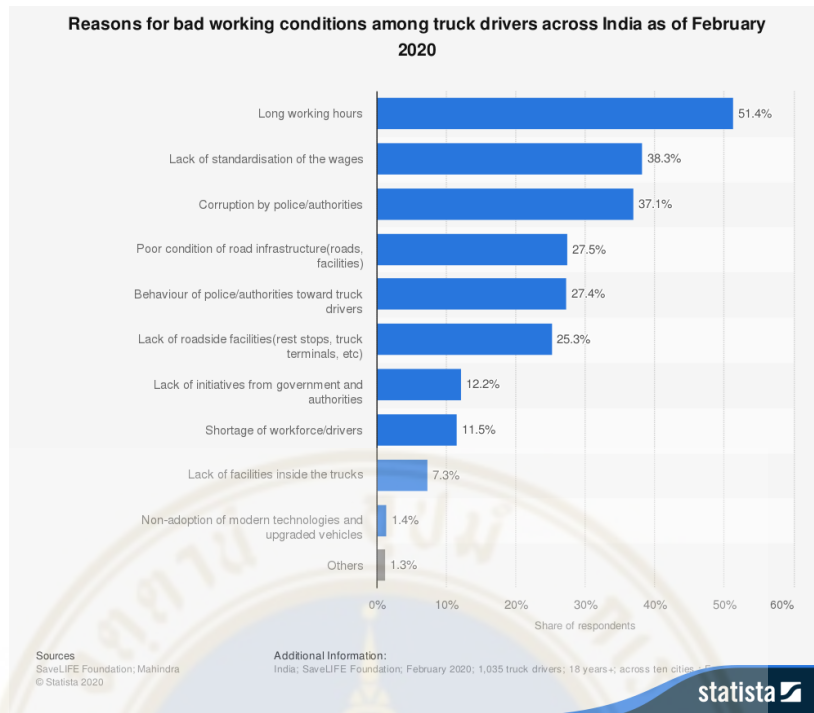


Figure 1.2 Reason for bad working conditions among truck drivers across India as of February 2020

According to the ATA record from the year 2017 that shows the increasing number of shortages in the truck drivers. They explained that the shortage of truck drivers is not only happening because of the turnover but it can happen by demographic (age and gender), lifestyle, more job alternatives, and regulation.

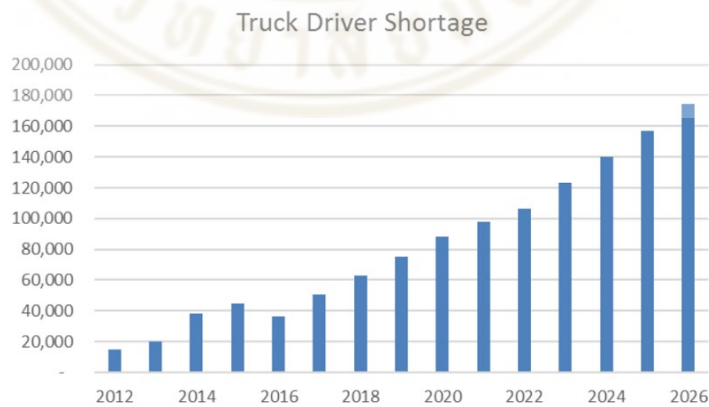


Figure 1.3 The increasing number of truck drivers from the year 2012 to the year 2026 (Source: American Trucking Association)

Related to ATA, The age of truck driver also related to the shortage of truck driver as the graph from Statista have collected the age structure in Thailand from the year 2008 to the year 2018, there are more than half of Thai citizen age about 15 years old to 64 years old and the result shows that they are an increasing number of people age 65 years old and older by 3.49%. And there is a chance to increase every year (Costello and Suarez 2015). As in Thailand, there is the regulation about the age of worker should not more than 60 years old, if he/she is older than 60 years old, the employer required to pay a lot when they left the company.

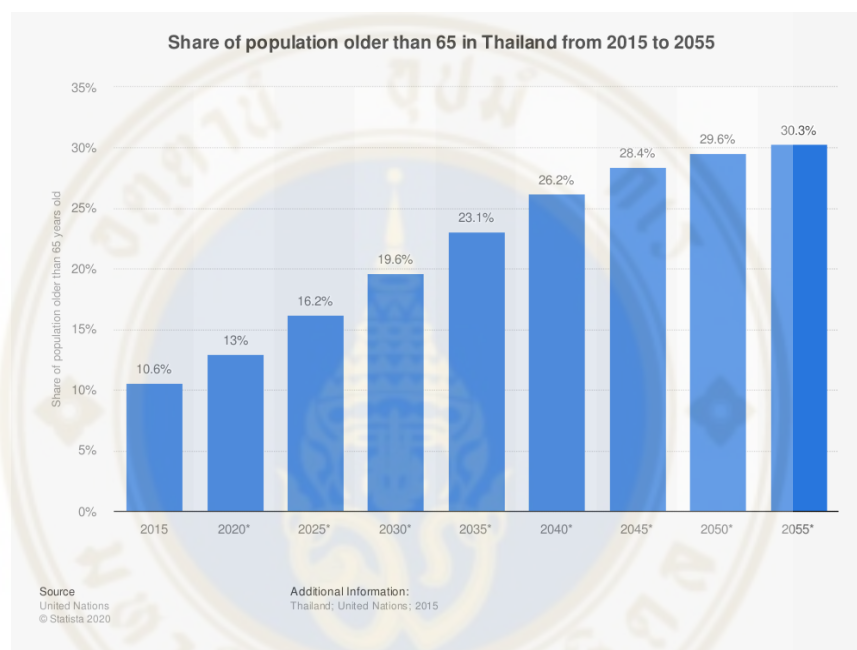


Figure 1.4 Share of the population older than 65 in Thailand from 2015 to 2055 (Source: Statista)

In conclusion, we wish that the autonomous project can be operated in the near future, it would be excellent to have it. The autonomous truck project might take a long time to invent and establish as the company needs to clarify and make sure before implementing and distribute it to the logistics company to use it on the public road.

1.3 Research Question

How is Thai's stakeholder attitudes and technology resistance toward autonomous vehicle acceptance in Thailand?

1.4 Research Objective

- To study the stakeholder's attitude toward autonomous vehicle technology
- To observe how much chance of acceptance to use the autonomous truck in Thailand
- To study the concern problem of stakeholder toward autonomous vehicle technology

1.5 Research Scope

The research will be focused on all stakeholder that have an impact on the evolution of autonomous trucks who use the public road in Thailand which I plan to collect the data from all gender, age, and society level. Since technology has been developed, intelligent connectivity is booming, and the increasing number of shortages in truck drivers, it will be beneficial for all citizens and the environment.

CHAPTER II

LITERATURE REVIEW

After the U.S. Defense Advance Research Project Administration (DARPA) has created a contest about developing Autonomous cars (Fagnant and Kockelman 2015).

People are dreaming of a car that does not require a driver or we know as Autonomous vehicles (AV), driverless cars, or self-driving cars. So, it spread to the truck dealer to adopt this technology with their products. The National Highway Traffic Safety Administration (NHTSA) categorized AV into five levels which each level has a different context (Anderson, Kalra et al. 2016).

- Level 0: The human driver is in complete control of all functions of the car.
- Level 1: One function is automated.
- Level 2: More than one function is automated at the same time (e.g., steering and acceleration), but the driver must remain constantly attentive.
- Level 3: The driving functions are sufficiently automatic that the driver can safely engage in other activities.
- Level 4: The car can drive itself without a human driver.

2.1 Autonomous Vehicle

Automated vehicles (AVs) refer to the vehicle that is able to sense its navigating and environment without human control (Zhang, Tao et al. 2019). The solution for reducing accidents is to eliminate human action from driving such as autonomous vehicles which are fully automation passenger vehicles. These autonomous vehicles which also referred to “self-driving” vehicles or “driverless” vehicles. Autonomous trucks will operate without human interference, utilizing based on the computer system to detect and gather information of the surrounding environment,

identify aisle and risks, as well as control functions such as the speed and drive to navigate the vehicle. Even though the autonomous vehicle is invented but it does not completely remove the human action from driving; they need to develop the algorithm and write the code to control the system. Thus, there is still a human error in an accident, but it has the potential to become lower (Hulse, Xie et al. 2018). In 2013, the Autonomous vehicle was tested and examined to the technical aspect and feasibility of AVs and the impacts on congestion and safety (Haboucha, Ishaq et al. 2017).

2.2 Autonomous Truck (Driverless truck or Auto-Driving Truck)

Automated vehicles (AVs) refer to vehicles that are capable of sensing its environment and navigating without human input. As the intelligent connectivity which included 5G network, Internet of Things and artificial intelligence, and machine control so the autonomous vehicle is becoming interested in many business sectors. There is a lot of money by funding from the industry, academia and government to support an autonomous vehicle project and they also give manpower for it. There are many positive effects of autonomous trucks as they can save fuel consumption, decrease in release emission and decrease traffic consumption (Song, Chen et al. 2019).

2.2.1 Perceived Usefulness

In Technology Acceptance Model which have perceived usefulness and perceived ease of use are the two external variables that mostly contribute acceptance in technology. Davis (1989) has described Perceived usefulness as the rate to which people believe in using the system would complement his or her job conduct. As the definition, Perceived usefulness, it is really close to performance expectancy in UTAUR and it also describes how the system is able to use advantageously (Xu, Zhang et al. 2018).

2.2.1.1 Safety

Autonomous vehicles have a possibility to definitely decrease crashes that happen from some combination of distraction, alcohol, drug involvement and/or fatigue. At least 40% of fatal crash-rate reduction by using self-driven vehicles and it will not make errors as human failings. Automated malfunction can minimize the

levels of long-distance, poor weather driving and nighttime driving. Automated malfunction does not reflect on crashes due to aggressive driving, speeding, inexperienced, slow reaction times, inattention, over-compensation and other assorted driver ship comings. Over 90%, the drivers believe their own reason and sense, so it is the cause of the crash. Even though there are critical reasons behind the crash as to the roadway, environment or vehicle, also human factors such as distraction, inattention or speeding are usually found to the crash occurrence and/or injury severity (Fagnant and Kockelman 2015).

2.2.1.2 Congestion and traffic operations

To develop ways of Autonomous vehicle technology to reduce the fuel consumption and traffic congestion. For example, Autonomous vehicles can assume and predict vehicles of braking and accelerating decisions. This technology is excellent as they provide a smoother braking system and the speed adjustment that the driver should follow, so it is the main reason of reducing the fuel consumption, and reduction in traffic problems (Fagnant and Kockelman 2015).

2.2.1.3 Travel-behavior impacts

There is a good signal of travel behavior due to the safety and reduction of congestion on the road that occur by Autonomous vehicles. For example, Autonomous vehicles can support young children, those who can't drive, the elderly, and the disability. As autonomous vehicles can do self-park so it may impact on the parking pattern to be in less-expensive areas. Autonomous vehicle can serve and expand multiple persons as it can share a car or a ride (Haboucha, Ishaq et al. 2017).

2.2.1.4 Freight transportation

Autonomous vehicles can impact freight transport both on and off the road. As one example, they are a mining company which is named Rio Tinto. They have 53 self-driving ore trucks and they drive about 2.4 million miles and carry 200 million tons (Rio Tinto, 2014). Also, the same technologies can contribute from autonomous cars to the trucking industry as it can increase fuel economy and lower the need for truck drivers. For transporting the worker still requires for load and unload the cargo but they no need to drive for long-distance journeys. The technology may face resistance from blue worker or labor groups, like teamsters and competing industries such as freight that use railroad (Fagnant and Kockelman 2015).

2.2.1.5 Available time for truck drivers

Autonomous vehicles allow the drivers to have more free time while driving as they no need to monitor the roadways. So, they can do other activities such as sleeping, relaxing, eating or working while the truck is run (Fagnant and Kockelman 2015).

2.2.2 Perceived Ease of Use

Perceived Ease of Use means the scope of people believe that it will not require effort while they are using autonomous vehicles. Its relevance cannot change or devalue in autonomous vehicle acceptance that autonomous vehicle's operation is entirely new experience which require a lot of effort to learning it (Zhang, Tao et al. 2019)

2.2.3 Trust

Trust can be defined as our intention to put ourselves in a position at risk with technology, along with the positive expectations of the result or the positive traits of future behavior. The definition above can be broken down into three compassion, belief of capacity and completeness, with capacity meaning to have a know-how and erudition to achieve the task; completeness meaning to keep the promise to complete the mission; and compassion refer to this as an automatic vehicle issue, in this case, to look after the interests of users. When the user has trustiness in an autonomous vehicle, believe in its ability and the service provider that they can protect his/her information from abuse and problems that may occur in the future. Users may find that "Reducing in humanity" to lose "choice and control" when behind the wheel of the car that drives by itself. Driverless car means the user will have dependence on car control that monitors the vehicle's internal factors, including road driving, driving conditions, and checking electrical signaling information together with the infrastructure or vehicle or other vehicles in the vicinity or the government that may participate in supervision activities (Kaur and Rampersad 2018).

2.2.4 Social Influence

Social Influence is the term which the perception of a person that is important for him or her should believe to use the new system (Adnan, Md Nordin et al. 2018).

It is the perception of the public that will be related to the adoption of autonomous vehicles. Moreover, autonomous vehicles will be vulnerable for road users particularly for pedestrian and bicyclist and the perception of road users towards autonomous vehicles. Also, there is a chance for autonomous vehicles to run on the road or share the road with other users, so it needs to know the facts from the public about their perception. To use autonomous vehicles is also related with the policies and electing politicians that will allow the autonomous vehicles to share the road with other users. To understand other perceptions, they should focus on public feeling, expectation, prediction and belief towards autonomous vehicles (Penmetsa, Adanu et al. 2019).

2.2.5 Attitude

The attitude means an individual's positive or negative feelings toward using technology. Various studies have found that most consumers that have a positive attitude toward technology tend to have higher intention to use it. By the way this factor has been confirmed as it is the most stable one in the original of Technology Acceptance Model (Zhang, Tao et al. 2019).

2.2.6 Perceived Risk

The perception of risk theory is used to describe consumer behavior. Essentially research has examined the impact of risk on traditional consumer decisions. Peter and Ryan (1976) defined the perceived risk as expected subjective loss and Featherman and Pavlou (2003) determine the risk that is perceived as a potential loss when taking the desired results. To determine Perceived Risk, Lee Ming-Chi (2019) has separated into 6 types, performance risk, the possibility of product malfunctions and not working as designed and advertised and therefore unable to deliver the desired benefits; Social risk, loss of status that may occur in one of the social groups as a result of using products or services that are foolish or useless; Financial risk, the possibility that a purchase results in a loss of money including the consequent maintenance costs of the

product; Privacy risk, Losses that may arise from the control of personal information, such as when information is used about you without your knowledge or permission. Severe cases are where consumers are "falsified", meaning criminals use their identities in counterfeit transactions; Time risk, consumers can waste time when making poor purchase decisions by spending time researching and making purchases, learning how to use products or services just to replace them if they do not meet expectations; and Physical risk, the possibility that the product is purchased results in a hazard to human life (Lee 2009).

It needs to be confirmed that it is safe for drivers, passengers and other road users and reduction in traffic crashes that happen by humans has motivated the evolution of autonomous vehicles. Safety is the main selling point of autonomous vehicles. But for humans, autonomous vehicles are linked with risks, loss of control and uncertainty as they cannot believe in technology. Driving is an activity that is requiring the most safety to do this activity. Most of the users demand for safety more than self-drive. The public think that self-driving vehicles should be four to five times as safe as human driven vehicles. Its users cannot perceive enough safety from using autonomous vehicles so they cannot expect to accept this technology and adopt autonomous vehicles. Also, many people concern safety and security issues on autonomous vehicles which lead the user to be unwilling to use autonomous vehicles (Xu, Zhang et al. 2018).

According to Menon et al. (2016), the majority of the public extremely about 36.5% or moderately about 52.6% have concerned with the safety of autonomous vehicles and road users which about 7.1% did not concern at all. Most people are worried about safety due to the system or equipment failure was the reason for people unlikely to use the autonomous vehicles (Zhang, Tao et al. 2019).

From (Hudson, Orviska et al. 2019), most of the user's concern on equipment failure, deal with unexpected situations, legal liability, privacy issues and system hacking. They also found that men are more willing to use this technology than women.

2.2.7 Resistance to Change

According to (Bauer 2012), resistance is unsuitable to use in the new technology context. Using this word most people think that it implies a managerial and

technocratic bias. By the way, he was confident that 'resistance' would prove unclear in meaning and rich in meanings, especially in the European context. In this context, it really challenges the idea of resistance and to revise the historical events, to revive the ideas. In (Bauer 2012)'s view this may be achieved by analyzing the resistance in terms of various results.

According to Lapointe Liette and Rivard Suzanne, 2005, there are five basic components of resistance behaviors, subject, object, initial conditions and treats.

2.2.7.1 Resistance behavior

Behavior is the main dimension of resistance such as behavior, responses and action found in almost all definitions. Anti-behavior exists throughout the spectrum, does not cooperate patiently with participation in destructive behavior or from lack of participation to wreck (Lapointe and Rivard 2005).

2.2.7.2 Object of resistance

The resistance verb is a transitive verb, which means that it must use the object directly. Identifying and understanding this object is important because resistance is shaped in part by "Contents of being opposites" (Lapointe and Rivard 2005).

2.2.7.3 Perceived Threats

Perceived Threats is identified by expressions such as "Obsessive emotional pain" or "perception of dangerous situations". Users resist changes that they believe will result in loss of stature, loss of income or loss of power (Lapointe and Rivard 2005).

2.2.7.4 Initial conditions

Some authors emphasize the role of perpetrators of resistance. They argue that resistance to understanding requires attention on the subject. Some people or groups may accept the change, but others may reject it. In addition to the ability or lack of awareness of threats, certain prerequisites, such as decentralization or established routines, may influence how the perceived threat of an object is (Lapointe and Rivard 2005).

2.2.7.5 Subject of resistance

The issue of opposition is an entity that uses resistance behavior when studying resistance from a psychological point of view about being an individual (Lapointe and Rivard 2005).

2.2.7.6 Resistance of Autonomous Vehicle

Kyriakidis et al. (2015) used an internet survey to analyze 5,000 responses to autonomous vehicles from 109 countries. This was a minor problem because the answer was biased towards internet users who might not represent the population as a whole. Respondents from developed countries feel uncomfortable with transmission of information from vehicles (Hudson, Orviska et al. 2019).

2.2.8 Autonomous Truck Acceptance

Acceptance is "a condition to allow new automotive technology to achieve the expected level of benefits." This definition means that acceptance is necessary for the introduction of new technology in transportation systems. Adell et al. (2014) also consider acceptance of the driver in the vehicle's interior system: "The level that each person integrates with his / her driving system or if the system is not available, intends to use it". Although the acceptance is determined in different ways, the general understanding is that it is a multi-faceted concept. Researchers usually focus on one-sided acceptance. Human behavior and various theories about the acceptance of technology proposed to explain user acceptance including the Unified Theory of Acceptance and Use of Technology (UTAUT), UTAUT2, Technology Acceptance Model (TAM) and Theory of Planned Behavior (TPB) (Xu, Zhang et al. 2018).

2.3 Existing Reference Framework

2.3.1 TAM Model

While perceived usefulness is correlated with utility values from system usage and can be set to the level that a person believes that the use of certain technologies will increase his / her performance. Perceived Easy to use refers to the level that individuals believe that using specific technology will not require effort. Both of these variables have an effect on attitude and behavioral intention. Attitude refers to the

evaluation of technology users while behavioral intentions indicate the level at which users are willing to perform certain behaviors (Pantano 2012)

TAM has been extended with multiple acceptance factors for the development of outstanding models that can better predict user behavior in various applications (Pantano 2012).

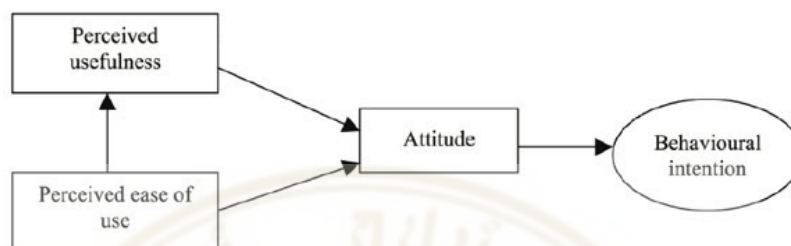


Figure 2.1 Technology Acceptance Model (TAM) developed by Davis (1989)

2.3.2 Extended from TAM

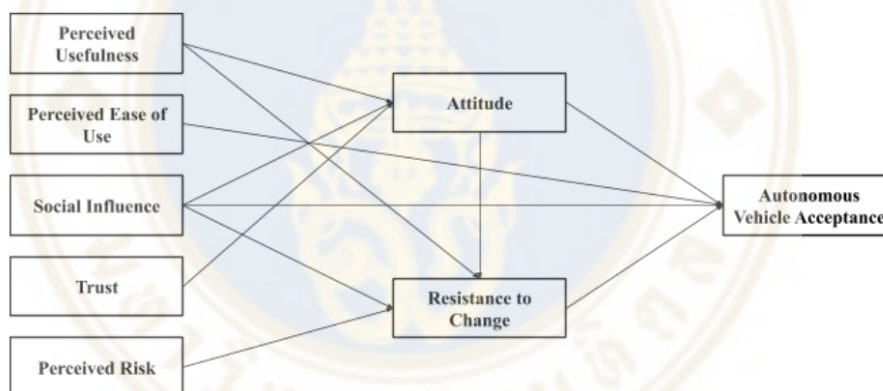


Figure 2.2 Extended model from Technology Acceptance Model (TAM)

CHAPTER III

RESEARCH METHODOLOGY

This chapter discusses the research methodology, which can be divided into four main topics, data source, data collection, data measurement, and data analysis. First, the source of data discussed the target population of the research, sampling method and sample size. Second, the data collection discusses the procedure to collect from the questionnaire are quantitative. Third, the techniques to measure data collected from the questionnaire are discussed. Finally, the data analysis statistical technique used in this research.

3.1 Data Source

3.1.1 Target Population

The research is done in Thailand since “autonomous trucks have the potential to be used in all parts of Thailand even the head branch is located in Bangkok and metropolitan areas”. Therefore, the population in this research is various as they have an impact on autonomous truck acceptance.

3.1.2 Sampling Method

The research uses simple random sampling, which is one method of probability sampling method. “Simple Random Sampling (SRS) is one type of sampling that is often used as a sampling technique”. For SRS principle, the sample has the same probability to be chosen but it may be across sampling design (Meng 2013).

3.1.3 Sample Size

According to a well-known researcher named Kline (1998), an acceptance of sample size should always be 10 times the amount of the parameters in Path analysis.

3.2 Data Collection

The data was collected using quantitative methods which is sample survey research.

3.2.1 Sample Survey Research

Data is gathered from stakeholder which are people that involve and impact on Autonomous trucks or people who are using the public road in Thailand. The survey, which is a structured interview with the questionnaire, was used to collect most of the primary data used in this research.

3.2.3 Preparation for the survey

The survey was conducted online via Google form. In order to avoid time-consuming for a survey and have a fast implementation.

3.3 Data Measurement

The questionnaire is composed of 32 questions divided into two parts as follows (Please see the full questionnaire in Appendix A)

ความคิดเห็นและการยอมรับ ยานพาหนะไร้คนขับในประเทศไทย (สำหรับรถสิบล้อและรถบรรทุก)

ส่วนที่ 1 บทนำ

อธิบายถึงรถบรรทุกไร้คนขับและประโยชน์ของยานพาหนะไร้คนขับ

รถบรรทุกไร้คนขับ (Autonomous Truck)
 โดยมีการประยุกต์ใช้จากเทคโนโลยีหลายสิ่งประกอบกัน ได้แก่

- เซ็นเซอร์ (เพื่อจับสัญญาณสิ่งกีดขวางรอบตัวรถ)
- IoT (INTERNET OF THINGS)
- ปัญญาประดิษฐ์ (AI : Artificial Intelligence) ใช้ในการจดจำบริบทต่างๆบนท้องถนนและวิเคราะห์สถานการณ์ต่าง เช่นการหยุดรถ หรือเคลื่อนที่ไปต่อ
- Big Data Analytics (เพื่อความอัจฉริยะในการขับขี่)

ประโยชน์ของยานพาหนะไร้คนขับ

1. ท้องถนนจะมีความปลอดภัยมากขึ้น -> ยานพาหนะเกิดการสื่อสารกันและตอบสนองกันอย่างรวดเร็ว
2. การจราจรและการใช้เชื้อเพลิงจะเป็นไปอย่างมีประสิทธิภาพมากขึ้น -> ระบบอัตโนมัติจะทำให้ยานพาหนะขับเคลื่อนด้วยความเร็วที่เหมาะสมทั้งด้วยควบคุม การเบรกและคันเร่งอย่างมีประสิทธิภาพ ลดการใช้พลังงานโดยไม่จำเป็นและยังสามารถลดการปล่อยก๊าซที่จะทำให้เกิดสภาวะเรือนกระจก
3. มีเวลามากขึ้น -> เมื่อยานพาหนะขับเคลื่อนอัตโนมัติ ผู้ใช้งานสามารถนำเวลาในการเดินทางไปทำอย่างอื่นได้อย่างเต็มที่ และการที่ระบบอัตโนมัติช่วยลดการเกิดอุบัติเหตุ จะทำให้เวลาในการเดินทางสั้นลง เนื่องจากรถทุกคันมีการสื่อสารกันและขับเคลื่อนอัตโนมัติ

ที่สำคัญ "สัญญาณ 5G" มีส่วนในการทำให้เกิดยานพาหนะไร้คนขับเนื่องจากสัญญาณ 5G จะถูกนำมาใช้ ในการเชื่อมกับทุกสรรพสิ่ง ดังรูป

THE CONNECTED COMMUNITY

Figure 3.1 Example of questionnaire format

Part A: Perceived characteristic and other factors of Autonomous Truck

Part B: Personal Detail of Respondent

The measurement scales used in the questionnaire are nominal and interval scales. The measurement techniques used in the questionnaire are single response, Likert scale and dichotomous scale as shown in Table 3.3 A-B. Most of the questions in the questionnaire use a 5-level Likert scale to measure the perception and attitude of the respondent. To define the minimum and maximum length of the 5-point Likert type of scale. Also, the questions require an answer of the Determinant-choice question (respondent chooses one and only one choice from 3 or more options). The respondent is asked to score the degree of agreement or disagreement with each statement in five levels as shown below.

“1” = Strongly Disagree

“2” = Disagree

“3” = Neutral

“4” = Agree

“5” = Strongly Agree

The designed questionnaire is corresponded with the research framework. Table 3.2 A-B shows variables of the research, data type, measured technique and reference question in the questionnaire.

Table 3.1 Data Scale and Measured Technique on Each variable in Part A

Factor Group	Variable	Data Type	Measured Technique	Question No.
Attitude	Traffic congestion	Interval	Likert 1 - 5	Q1
	Road injuries and Human fallibility	Interval	Likert 1 - 5	Q2
	Emission and Greenhouse effect	Interval	Likert 1 - 5	Q3
	Fuel consumption	Interval	Likert 1 - 5	Q4
	Fatigue of drivers	Interval	Likert 1 - 5	Q5
	Adapting with other logistic	Interval	Likert 1 - 5	Q6
Social Influence	Partnership with famous brand	Interval	Likert 1 - 5	Q7
	Influence from Friend(s)	Interval	Likert 1 - 5	Q8
	News about Achievement	Interval	Likert 1 - 5	Q9
	Social influencers	Interval	Likert 1 - 5	Q10
Trust	Believe in technology	Interval	Likert 1 - 5	Q11
Perceived usefulness	Make life more safety	Interval	Likert 1 - 5	Q12
	Enhance the comfortable life	Interval	Likert 1 - 5	Q13
	Improving logistic of entire country	Interval	Likert 1 - 5	Q14

Table 3.1 Data Scale and Measured Technique on Each variable in Part A (cont.)

Factor Group	Variable	Data Type	Measured Technique	Question No.
Perceived ease of Use	Easy to learn and easy to understand	Interval	Likert 1 - 5	Q15
Perceived Risk	Illegal access	Interval	Likert 1 - 5	Q16
	Data Leakage	Interval	Likert 1 - 5	Q17
	Breakdown	Interval	Likert 1 - 5	Q18
	Breakdown and Fatality	Interval	Likert 1 - 5	Q19
Resistance to change	Hard to establish in Thailand	Interval	Likert 1 - 5	Q20
	Impact on Driver turnover rate	Interval	Likert 1 - 5	Q21
	Resist about Autonomous Truck	Interval	Likert 1 - 5	Q22
	Disagree even doing testimonial	Interval	Likert 1 - 5	Q23
Autonomous Vehicle Acceptance	Accept the technology if they test on road in other country	Interval	Likert 1 - 5	Q24
	Accept the technology if they test on road in Thailand	Interval	Likert 1 - 5	Q25
	Accept technology in the next 5 years	Interval	Likert 1 - 5	Q26
	Workable on Real Life	Interval	Likert 1 - 5	Q27

Table 3.2 Data Scale and Measured Technique on Each variable in Part B

Factor Group	Variable	Data Type	Measured Technique	Question No.
Socioeconomic	Gender	Nominal	Single Response	Q28
	Age	Nominal	Single Response	Q29
	Education	Nominal	Single Response	Q30
	Income	Nominal	Single Response	Q31
	Media Channel	Nominal	Single Response	Q32

3.4 Data Analysis

Using IBM SPSS AMOS version 20 for Windows, computer program to analyze frequency, Crosstabulation and Path analysis (SEM).

Data process are as follows:

1. A descriptive statistic is used to explain the respondents' information such as gender, age, education, monthly income, and media channel. The results will be in the form of mean, frequencies, standard deviation and significance.
2. Finding difference in the rating of the attitude and technology resistance toward autonomous vehicle acceptance in Thailand in many aspects by perceived usefulness, perceived ease of use, perceived risk, social influence, trust, attitude and resistance to change by use of analysis of Covariance structure. (Path analysis, SEM)
3. Testing the relationship between two variables or multi-variables by using Crosstabulation method such as perceived usefulness, perceived ease of use, perceived risk, social influence, trust, attitude and resistance to change.

CHAPTER IV

RESEARCH FINDING AND ANALYSIS

According to the research methodology from chapter 3, the results from the data analysis describe the frequency, Crosstabulation and Path analysis (SEM) as shown below.

4.1 The results in frequency distribution

In this research collected data by online survey (Google form) which targeted on Thai people that have an impact on autonomous vehicles. There are 142 respondents in this research.

The respondents included 85 females and 57 males. The majority in this research are the people who have age range between 21 - 29 years old which account for 54.2%, following by 35.2% of people who are between 30 - 49 years old, 2.1% of people who are under 18 years old, 1.4% of respondents who are range between 50 - 59 years old and 0.7% of respondents who are range between above 60 years old. For Education, most of the respondents who had an education level equal to bachelor's degree which have 63.4% respectively. Moving to monthly income, most of respondent have salary around 10,001 to 30,000 Thai baht which account for 30.4% and around 30,001 to 50,000 Thai Baht which account for 21.8%. Lastly, 98.6% are people who receive information by online channels such as websites, YouTube, Line, Facebook, Twitter, Online newspaper, and blog.

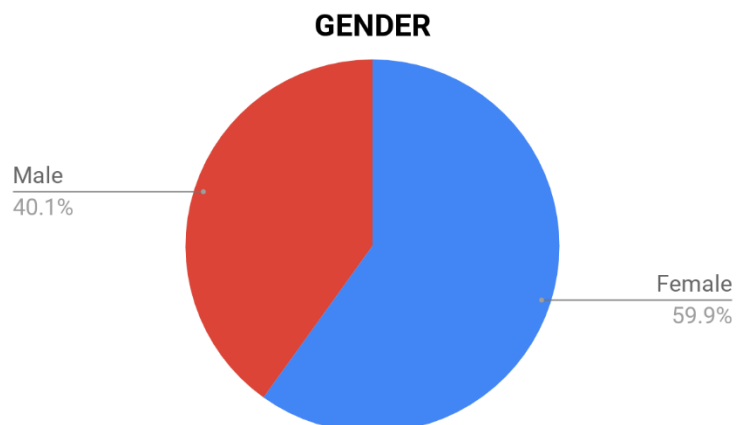


Figure 4.1 Genders

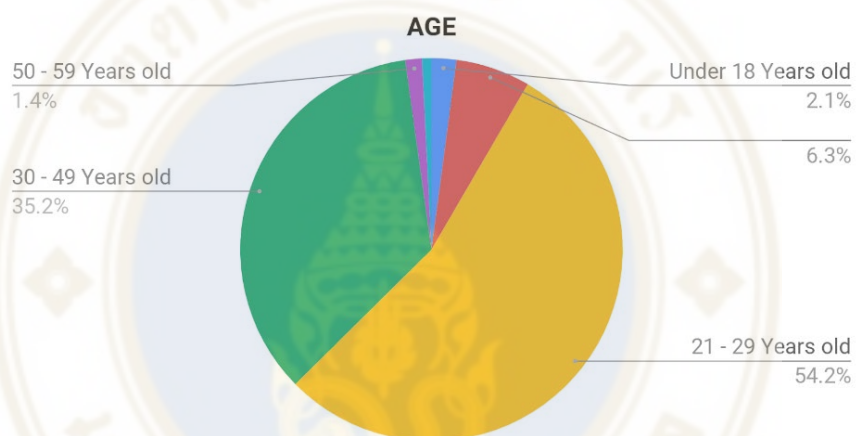


Figure 4.2 Age

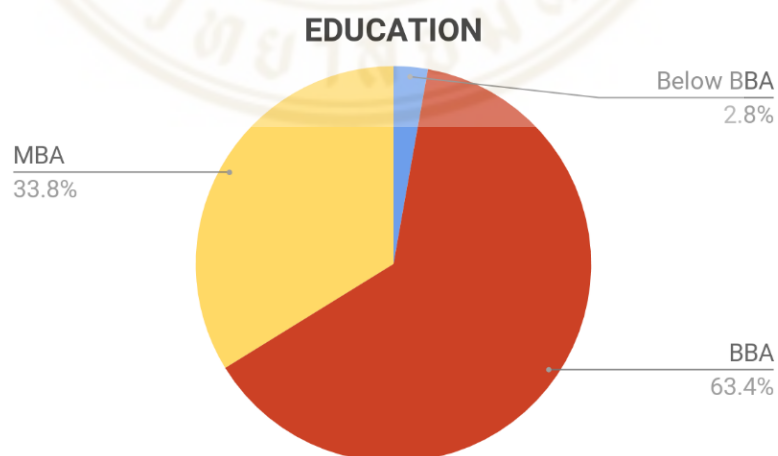


Figure 4.3 Education

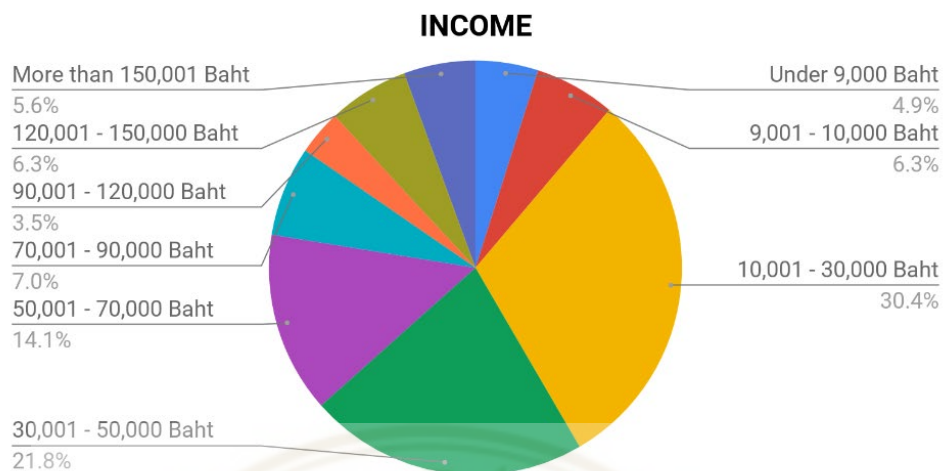


Figure 4.4 Income

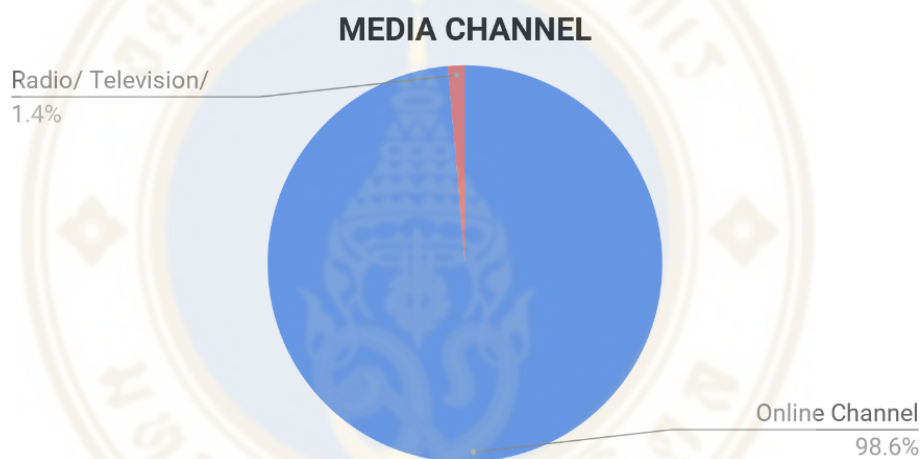


Figure 4.5 Media Channel

4.2 The results in term of analysis the descriptive statistics of each factor

The table showing Mean and Standard Deviation of the five-points Likert scale questionnaire in different factor.

Table 4.1 Descriptive Statistics

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Attitude	142	1.33	5.00	3.9272	.79087
Social Influence	142	2.00	5.00	3.8310	.69862
Trust	142	1.00	5.00	3.6268	.94987
Perceived usefulness	142	1.00	5.00	3.8967	.89758
Perceived ease of use	142	1.00	5.00	3.4930	1.08991
Perceived risk	142	2.00	5.00	4.2324	.73517
Resistance to change	142	1.00	5.00	3.0335	.83115
Autonomous vehicle acceptance	142	1.50	5.00	4.1109	.73690
Valid N (listwise)	142				

4.3 The Results in Term of Analysis of Reliability Analysis

To test the reliability and measure the consistency between eight factors which alpha coefficient of all items is .832, it means that all items have relatively high consistency. Moreover, running the analysis the reliability coefficient of .70 or higher will be acceptance.

Table 4.2 Reliability statistic**Reliability Statistics**

Cronbach's Alpha	N of Items
.832	27

4.4 The results in terms of Cross Tabulation method and interpretation

4.4.1 The table will show the relationship between autonomous vehicle acceptance (APA) and gender.

4.4.1.1 Statement: I will accept the technology and system of autonomous vehicles if there is a road trial in other country.

Table 4.3 The number of respondents who have different gender versus autonomous vehicle acceptance (Testing on the road in other countries)

Gender		I will accept the technology and system of autonomous vehicles if there is a road trial in other country.					Total
		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	
Gender	FEMALE	3	2	20	32	28	85
	MALE	1	3	7	13	33	57
Total		4	5	27	45	61	142

Interpretation

According to Table 4.3, this statement shows that Male willing to be accept the technology if it tests on the road in other country than Female which is 33 comparing to 28 respondents, respectively. And there are 42% of people who are strongly agree for this statement.

4.4.1.2 Statement: I will accept the technology and system of autonomous vehicles if there is a road trial in Thailand.

Table 4.4 The number of respondents who have different gender versus autonomous vehicle acceptance (Testing on the road in Thailand)

		I will accept the technology and system of autonomous vehicles if there is a road trial in Thailand.					Total
		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	
Gender	FEMALE	1	3	15	26	40	85
	MALE	1	2	6	18	30	57
Total		2	5	21	44	70	142

Interpretation

According to Table 4.4, this statement shows that Female have the willingness to accept the technology if it tests on the road in Thailand than Male about 40 comparing to 30, respectively. Moreover, there were about 80% of respondents answer agree and strongly agree.

4.4.1.3 Statement: I will accept the technology and systems of autonomous vehicles in the next 5 years.

Table 4.5 The number of respondents who have different gender versus autonomous vehicle acceptance (Will accept technology in the next 5 years)

		I will accept the technology and systems of autonomous vehicles in the next 5 years.					Total
		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	
Gender	FEMALE	2	7	25	26	25	85
	MALE	2	1	15	14	25	57
Total		4	8	40	40	50	142

Interpretation

According to Table 4.5, there are the same number of male and female that show strongly agree on accepting technology in the next 5 years which is 35% out of 142 respondents.

4.4.1.4 Statement: I think it is possible to use autonomous vehicles.

Table 4.6 The number of respondents who have different gender versus autonomous vehicle acceptance (Think that technology is workable in real-life)

		I think it is possible to use autonomous vehicles.					Total
		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	
Gender	FEMALE	2	4	9	32	38	85
	MALE	0	2	8	14	33	57
Total		2	6	17	46	71	142

Interpretation

According to Table 4.6, there are 50% for strongly agree of both male and female respondent think that autonomous vehicle is possible to use in Thailand. Next 32% for respondent who answer agree on this statement.

4.4.2. The table will show the relationship between autonomous vehicle acceptance (APA) and media channel.

4.4.2.1 Statement: I will accept the technology and system of autonomous vehicles if there is a road trial in other country, I will accept the technology and system of autonomous vehicles if there is a road trial in Thailand, I will accept the technology and systems of autonomous vehicles in the next 5 years, and I think it is possible to use autonomous vehicles.

Table 4.7 The number of respondents who have perceive different media channels versus autonomous vehicle acceptance

		I will accept the technology and system of autonomous vehicles if there is a road trial in other country.					Total
		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	
Media	Online	4	5	26	44	61	140
	Offline	0	0	1	1	0	2
Total		4	5	27	45	61	142
		I will accept the technology and system of autonomous vehicles if there is a road trial in Thailand.					Total
		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	
Media	Online	1	5	20	44	70	140
	Offline	1	0	1	0	0	2
Total		2	5	21	44	70	142
		I will accept the technology and systems of autonomous vehicles in the next 5 years.					Total
		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	
Media	Online	4	8	39	39	50	140
	Offline	0	0	1	1	0	2
Total		4	8	40	40	50	142
		I think it is possible to use autonomous vehicles.					Total
		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	
Media	Online	2	5	16	46	71	140
	Offline	0	1	1	0	0	2
Total		2	6	17	46	71	142

Interpretation

According to Table 4.7, this statement shows that the majority of the respondents strongly agree that they will accept autonomous vehicle if it has a trial on the road in other country and in Thailand. Moreover, they will accept the technology and system in the next five years, and they think autonomous vehicle is possible to use in Thailand are people who use online media as a channel.

4.5 Path Analysis

Path analysis used to identify the factor that related in correlation matrix and it also extension from the regression model. The analysis can be interpreting both direct, indirect and total effects which shown by a line that link a square which shows the causation. Regression weight also forecasted by the model. Next the goodness of fit statistic is calculated in order to see the fitting of the model.

4.5.1 Test of the proposed model

Regarding to the literature reviews in Chapter two, it composes the research conceptual model in figure 4.6 towards autonomous vehicle (truck) acceptance. The path analysis implements with AMOS program to test the model fit. Maximum likelihood estimation (MLE) is a method that use to interpret the values for parameter of a model which is in SEM analytic tool.

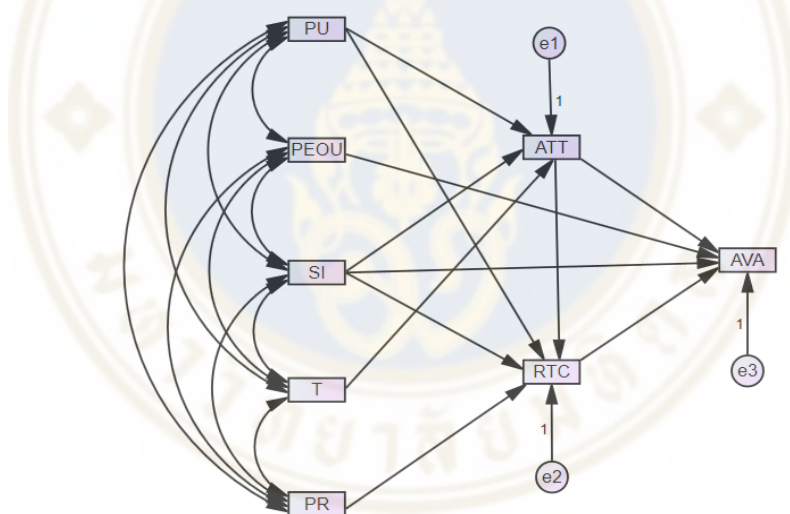


Figure 4.6 The correlation between each independent factor and its weight (Extended conceptual model from TAM)

Remarks

AVA (Autonomous Vehicle Acceptance), PU (Perceived Usefulness), PEOU (Perceived Ease of Use), SI (Social Influence), T (Trust), and PR (Perceived Risk), ATT (Attitude) and RTC (Resistance to Change)

4.6 The results in term of Correlation Coefficients with Spearman method

The graph shows the correlation coefficient with Spearman method for all variables as avoid the problem of multicollinearity so the variable should not exceed 0.70. It uses bivariate correlation method to test the model in SPSS.

Table 4.8 Correlation coefficient with Spearman method

			ATT	SI	T	PU	PEOU	PR	RTC	AVA
Spearman's rho	ATT	Correlation Coefficient	1.000	.483**	.483**	.565**	.414**	.056	-.240**	.511**
		Sig. (2-tailed)	.	.000	.000	.000	.000	.505	.004	.000
		N	142	142	142	142	142	142	142	142
	SI	Correlation Coefficient	.483**	1.000	.462**	.555**	.489**	.108	-.103	.463**
		Sig. (2-tailed)	.000	.	.000	.000	.000	.199	.225	.000
		N	142	142	142	142	142	142	142	142
	T	Correlation Coefficient	.483**	.462**	1.000	.661**	.469**	-.244**	-.387**	.423**
		Sig. (2-tailed)	.000	.000	.	.000	.000	.003	.000	.000
		N	142	142	142	142	142	142	142	142
	PU	Correlation Coefficient	.565**	.555**	.661**	1.000	.532**	.085	-.424**	.542**
		Sig. (2-tailed)	.000	.000	.000	.	.000	.312	.000	.000
		N	142	142	142	142	142	142	142	142
	PEOU	Correlation Coefficient	.414**	.489**	.469**	.532**	1.000	.073	-.149	.461**
		Sig. (2-tailed)	.000	.000	.000	.000	.	.385	.076	.000
		N	142	142	142	142	142	142	142	142
	PR	Correlation Coefficient	.056	.108	-.244**	.085	.073	1.000	.237**	.091
		Sig. (2-tailed)	.505	.199	.003	.312	.385	.	.005	.283
		N	142	142	142	142	142	142	142	142
	RTC	Correlation Coefficient	-.240**	-.103	-.387**	-.424**	-.149	.237**	1.000	-.310**
		Sig. (2-tailed)	.004	.225	.000	.000	.076	.005	.	.000
		N	142	142	142	142	142	142	142	142
	AVA	Correlation Coefficient	.511**	.463**	.423**	.542**	.461**	.091	-.310**	1.000
		Sig. (2-tailed)	.000	.000	.000	.000	.000	.283	.000	.
		N	142	142	142	142	142	142	142	142

** . Correlation is significant at the 0.01 level (2-tailed).

According to the result, almost of the variable is under 0.70 in a positive direction. Which perceived risk and resistance to change are the only factor that the correlates in the negative direction as the researcher intend to find the negative perception from the respondent to make sure that there are no bias in the questionnaire set. To conclude, the variable has no multicollinearity by following this result.

4.7 The results in term of analysis of Covariance structure (Path analysis)

After use of analysis of covariance (Path Analysis) to all independent variables, the result shows that perceived usefulness, perceived ease of use, perceived risk, social influence, trust, attitude and resistance to change have differences in autonomous vehicle acceptance. And it also shows direct effects and indirect effects between each independent variable by telling standardize regression weight.

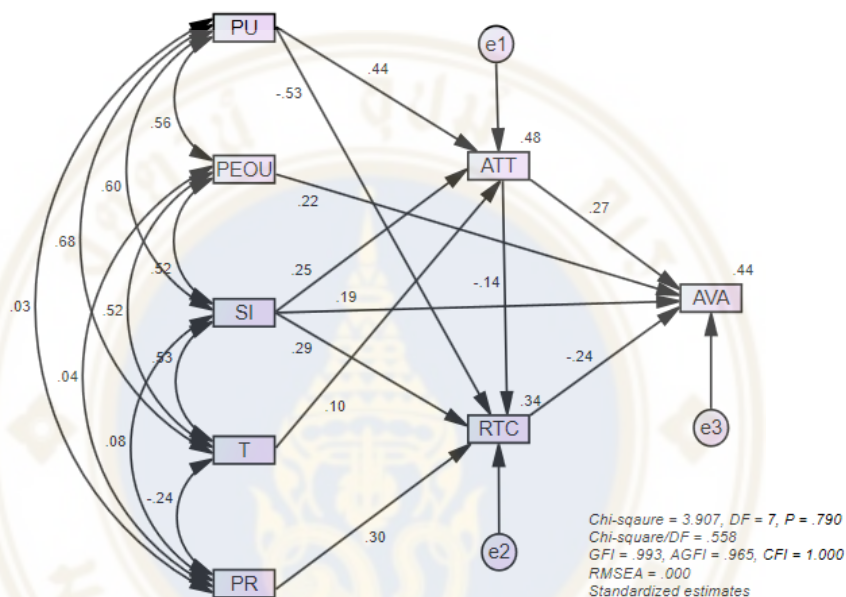


Figure 4.7 The result of estimate standardized regression weight

Table 4.9 Measure of model fit

Symbol	Name	Criteria	Result	Fit
CMIN-p	Chi-square probability level	$P > 0.05$	0.790	YES
CMIN/df	Relative Chi-square	≤ 2	0.558	YES
GFI	Goodness of fit index	> 0.90	0.993	YES
AGFI	Adjust goodness of fit index	> 0.90	0.965	YES

Table 4.9 Measure of model fit (cont.)

Symbol	Name	Criteria	Result	Fit
CFI	Comparative fit index	> 0.90	1	YES
Symbol	Name	Criteria	Result	Fit
RMSEA	Root mean square error of approximately	< 0.05	0	YES

4.7.1 Standardized Estimates

Table 4.10 Standardized Regression Weights

				Estimate
ATT	<---	SI		.253
ATT	<---	PU		.438
ATT	<---	T		.098
RTC	<---	SI		.286
RTC	<---	PU		-.527
RTC	<---	ATT		-.141
RTC	<---	PR		.296
AVA	<---	SI		.193
AVA	<---	RTC		-.238
AVA	<---	ATT		.272
AVA	<---	PEOU		.222

Interpretation

From this graph, it shows the estimate of Standardized Regression Weight that link each variable in the model. As the result, Attitude show the highest weight which is 0.272 that link to Autonomous Vehicle Acceptance. The following is Resistance to Change which is 0.238 and lastly is Perceived Ease of Use which is 0.222. for this table, it has no meaning for minus (-) sign as it uses only the number to analyze the weight.

Table 4.11 Unstandardized Regression Weights

	Estimate	S.E.	C.R.	P	Significance
ATT <--- SI	.430	.132	3.261	.001	YES
ATT <--- PU	.772	.157	4.917	***	YES
ATT <--- T	.488	.419	1.164	.244	NO
RTC <--- SI	.340	.107	3.180	.001	YES
RTC <--- PU	-.650	.121	-5.395	***	YES
RTC <--- ATT	-.099	.066	-1.492	.136	NO
RTC <--- PR	.335	.078	4.317	***	YES
AVA <--- SI	.204	.088	2.313	.021	YES
AVA <--- RTC	-.211	.060	-3.532	***	YES
AVA <--- ATT	.169	.051	3.331	***	YES
AVA <--- PEOU	.600	.205	2.931	.003	YES

Remark: Significance *p < 0.05, **p < 0.001

Interpretation

According to Table 4.11, Unstandardized Regression Weight or Regression Weight show the amount by which dependent variables changes if we change independent variable by one unit (Bhalla, n.d.) . To explain for this result, it shows that if Resistance to Change goes up by one-unit, Autonomous Vehicle Acceptance effect will go down by 0.211.

4.7.2 Descriptive Statistic and Correlation Matrix

Table 4.12 Estimates of covariances among exogenous variables

	Estimate	S.E.	C.R.	P	Significant
PU <--> PEOU	1.646	.282	5.839	***	YES
PEOU <--> SI	1.587	.288	5.517	***	YES

Table 4.12 Estimates of covariances among exogenous variables (cont.)

			Estimate	S.E.	C.R.	P	Significant
SI	<-->	T	1.403	.251	5.578	***	YES
T	<-->	PR	-.653	.240	-2.721	.007	YES
SI	<-->	PR	.678	.690	.983	.326	NO
PEOU	<-->	PR	.112	.268	.418	.676	NO
PU	<-->	PR	.239	.662	.360	.719	NO
PEOU	<-->	T	.536	.098	5.491	***	YES
PU	<-->	T	1.715	.258	6.646	***	YES
PU	<-->	SI	4.509	.735	6.135	***	YES

Table 4.13 Descriptive statistic and correlation matrix

	Mean	SD	PU	PEOU	SI	T	PR
PU	3.8967	0.898	1				
PEOU	3.4930	1.090	0.565**	1			
SI	3.8310	0.699	0.603**	0.525**	1		
T	3.6268	0.950	0.675**	0.522**	0.532**	1	
PR	4.2324	0.735	0.030	0.035	0.083	-0.235**	1

The result from Table 4.12, there are 6 pairs of significance at the level of $p < 0.001$ and 1 pairs that significance at the level of $p < 0.05$. However, there are three pair that show not significant values which are SI <--> PR, PEOU <--> PR and PU <--> PR that P-value are 0.326, 0.676 and 0.719, respectively.

4.7.3 Standardized Direct Effects and interpretation

Table 4.14 Standardized Direct Effects

	PR	T	SI	PEOU	PU	ATT	RTC
ATT	.000	.098	.253	.000	.438	.000	.000
RTC	.296	.000	.286	.000	-.527	-.141	.000
AVA	.000	.000	.193	.222	.000	.272	-.238

Interpretation

The results shows that Perceived Usefulness (PU) is the most factor influence audience to create Attitude (ATT) toward Autonomous Vehicle Acceptance (AVA), whereas Trust (T) and Social Influence (SI) influence the Attitude too. Conversely, Resistance to Change (RTC) show an obstacle of audiences having negative perception toward autonomous vehicle acceptance.

4.7.4 Standardized Indirect Effects and interpretation

Table 4.15 Standardized Indirect Effects

	PR	T	SI	PEOU	PU	ATT	RTC
AVA	-.070	.030	.009	.000	.259	.034	.000

Interpretation

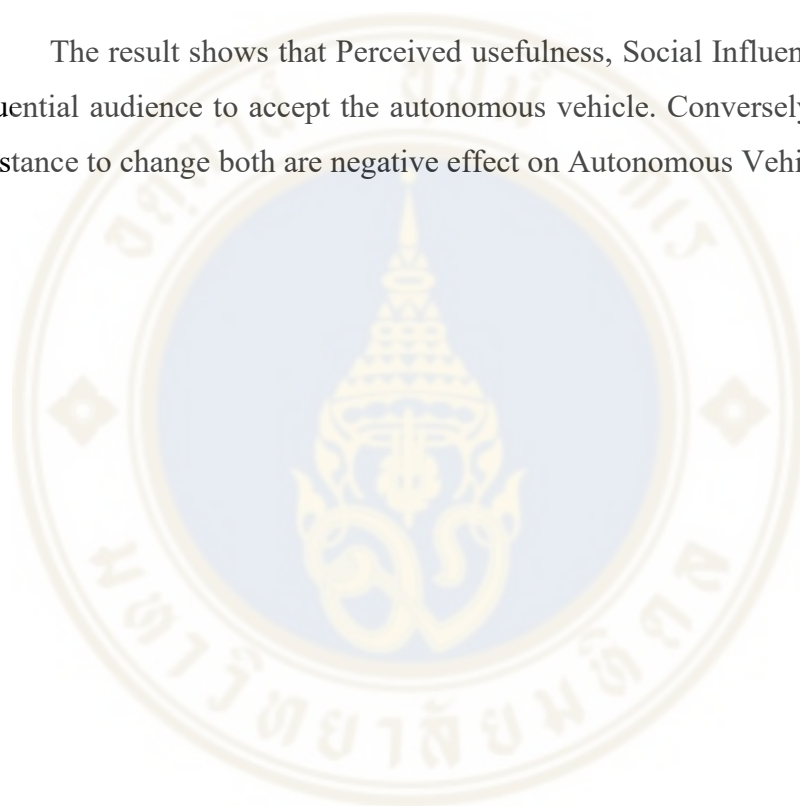
The result shows that Perceived Usefulness (PU) is the most influential that support the indirect effect the acceptance of autonomous vehicle following by Attitude (ATT), Trust (T) and Social Influence (SI). Conversely, Perceived Risk (PR) shows obstacle an obstacle of audiences having negative perception toward autonomous vehicle acceptance.

4.7.5 Standardized Total Effects and interpretation

Table 4.16 Standardized Total Effects

	PR	T	SI	PEOU	PU	ATT	RTC
ATT	.000	.098	.253	.000	.438	.000	.000
RTC	.296	-.014	.250	.000	-.589	-.141	.000
AVA	-.070	.030	.203	.222	.259	.306	-.238

The result shows that Perceived usefulness, Social Influence and Trust are the influential audience to accept the autonomous vehicle. Conversely, perceived risk and resistance to change both are negative effect on Autonomous Vehicle Acceptance.



CHAPTER V

CONCLUSION AND RECOMMENDATION

The objective of the research project was to understand how the customers' acceptance to autonomous vehicle through the Technology Acceptance Model (TAM), as well as study of technology resistance, social influence and trust structure as the determinants.

5.1 Discussion of research finding

This research proposes to study the factors that influence attitude and technology resistance regarding autonomous vehicle acceptance through quantitative research. The paper develops the TAM, Perceived, Resistance to Change, Trust and Social Influence as the conceptual model that consists of Perceived Usefulness, Perceived Ease of Use and Attitude.

The online questionnaire with items provides to the respondents who lives in Thailand with 142 valid samples. Analysis data with IBM SPSS AMOS program through Path Analysis is the key finding in this paper for direct, indirect and total effects between factors that influence the technology to get acceptance. The result from factors that influence the audiences' attitude to accept the technology is perceived usefulness that explain for 43.8%, social influence 25.3% and trust 9.8%. According to technology resistance influence autonomous vehicle acceptance by 23.8% which is linked with perceived usefulness 58.9%, perceived risk 29.6%, social influence 25%, and attitude 14.1%. Moreover, the acceptance of autonomous vehicle is influenced by perceived usefulness which are 25.9%, resistance to change 23.8%, perceived ease of use 22.2% and social influence 20.3%. From the result, it is clear that perceived usefulness is influence of all factor include attitude, resistance to change and autonomous vehicle acceptance with the highest rate.

The significance correlation between factor that show in the standardized correlation matrix are perceived usefulness and trust (0.675), social influence and perceived usefulness (0.603) and perceived ease of use and perceived usefulness (0.565). Inversely, perceived risk has the least correlation with all factor.

5.2 Limitation and Suggestions

5.2.1 Scope of the study

From the limitation of the method of this research is only focus on quantitative due to the limitation of time, a qualitative such as focus group or in-depth interview could be helping to understand the concentration of audience.

5.2.2 Population and demographic profile of the respondent

Moreover, this research is study only the perception of audience toward autonomous truck, this shows that the autonomous vehicle topic needs to discuss with other group as well, such as truck manufacturer, government agency, logistic company and end user. Also, the questionnaire is distributed on via google form which is online base so it might bias on the information of media channel of respondent used.

5.2.3 Implication for future research project

As the limited scope of study mentioned above, for future research project could enlarged the quality of the study for further area, not only Bangkok area. Furthermore, the research should focus other sector such as truck manufacturer, government agency, logistic company and end user, to learn more about the perception of each group. In addition, the research focus only perceived usefulness, perceived ease of use and technology resistance. For further research should focus on other factor that create a positive effect on autonomous truck acceptance by qualitative research such as in-depth interview and focus group.

5.3 Recommendation

From Path analysis model and AMOS SPSS program help the researcher to identify the correlation between the factor and identified the linkage between each factor.

5.3.1 Recommendation for Attitude

According to Attitude (ATT) factor which linked with Perceived Usefulness (PU), Social Influence (SI) and Trust (T) to make the audience more acceptance the autonomous vehicle. Therefore, the manufacturer and distributor should improve the attitude and viewpoint of the audience as it can increase the positive image of the autonomous truck.

This factor has the highest effect on acceptance toward autonomous vehicle of the audience. Therefore, my recommendation is the distributor and manufacturer should give the information of the technology and it useful to the audience to make them trust in autonomous vehicle such as give them knowledge how the autonomous vehicle can help and solve the problems of traffic congestion, road injuries that occur by human fallibility, reduce fatigue of truck driver, fuel consumption and emission. When the audience trust the product, they will be spokesperson for autonomous truck. Moreover, the manufactures might need to be a partner with the well-known company that expertise in this industry.

5.3.2 Recommendation for Resistance to change

Furthermore, the manufacturer and distributor also need to take attention on technology resistance as it also relates with the audience's acceptance on autonomous truck too. In the path analysis model, it shows that Resistance to Change (ATC) is linked with Social Influence (SI), Perceived Usefulness (PU), Attitude (ATT) and Perceived Risk (PR) which the manufacturer and distributor should find the solution to deal with this situation.

This factor has an effect on autonomous vehicle acceptance of the audience. For this factor, I would like to recommend that the distributor should find the solution to protect the breakdown that will occur fatality between end user and the audience.

Also, there concern about illegal access that might use the autonomous truck to make the audience get injury. Moreover, there are some group of the audience think that it hard to establish in Thailand and they think that it will impact on the driver job. So, the distributor should give the information about the way to establish and the system of autonomous vehicle that the road and motorcycle is not the problem of launching this technology. Also, the distributor should explain the usage of autonomous truck that how it will be benefit to the truck driver such as the driver can do other activity while the truck is running, they also have a meal and use mobile phone that make them more relax as they only need to control the system only.

5.4 Conclusion

Almost 82% of the respondents think that autonomous vehicle is possible to run in Thailand and there is 63% of the respondent will accept this autonomous in the near future. If the autonomous truck can be test on the road in Thailand, they will be more chance for audience to accept the technology. In Thailand, there are many cases of injuries that occur by truck. Also, there is many people that have attention on emission that sometime occur by the truck such as climate change, carbon monoxide, carbon footprint.

From a theoretical point of view, this research has served broaden the understanding of the factors influencing autonomous vehicle acceptance of the audience's view. One of the theoretical contributions of this study is the extension of TAM by including Perceived risk, Trust, Social influence and Technology resistance. As there are many factors that give a negative image and feedback on autonomous truck, so it leads to the doubt of acceptance of autonomous truck to use in Thailand.

From the result, the research found that attitude which include perceived usefulness, trust and social influence have an impact audience's acceptance. Moreover, the technology resistance can be reduced by give an information about perceived usefulness, build a good spokesperson on social influence and increase the audience's attitude. In additional, the analysis indicated that female and male tend to accept the technology in the next 5 years and both of gender think that the autonomous vehicle is possible to launch in Thailand.

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Appendix A: Quantitative Questionnaire Items



Questionnaire to extend the understanding of the attitude and technology resistance of Thai stakeholder towards autonomous vehicle acceptance in Thailand

This questionnaire is intended to explore consumer attitudes towards autonomous vehicles (trailer, semi-trailer or trucks) for the master's degree of the College of Management, Mahidol University. The collected information is for research case studies only. Information of all respondents will be kept only with the project leader and adviser. The questionnaire takes approximately 5-10 minutes.

What is Autonomous Vehicle?

Autonomous Vehicle (AV) has applications from many different technologies including Sensors (to detect obstructions around the car), IoT (INTERNET OF THINGS), Artificial Intelligence (AI) is used to recognize different contexts on the road and analyze different situations like stopping the car or keep moving and Big Data Analytics (for driving intelligence)

The benefits of Driverless vehicles

- The roads are safer - Vehicles communicate and respond quickly.
- Traffic and fuel consumption will be more efficient - Automated systems will allow vehicles to drive at optimal speed while maintaining control of the vehicle. Efficient braking and accelerator Reduce unnecessary energy use and can also reduce gas emissions that can cause glazing conditions.
- More time - when the vehicle is autonomous Users can take the time to travel to do other things fully. And having an automatic system reduces traffic jams Will shorten the travel time Because all cars are communicating and driving automatically

Items	Low ←————→ High				
	1	2	3	4	5
	Strong Disagree	Disagree	Neutral	Agree	Strongly Agree
Perceived Risk					
19. I am concerned if an autonomous vehicle system fails. Will be able to bring the loss of both life and property					
Resistance to change					
20. I think it is difficult to use an autonomous vehicle system in Thailand.					
21. I think driverless vehicles play a big role in making drivers lose their jobs.					
22. I do not agree with the driverless vehicle system.					
23. I think that if an autonomous vehicle is introduced, I won't support it either.					
Autonomous Vehicle Acceptance					
24. I will accept autonomous vehicle technology and systems if I am tested on roads abroad.					
25. I will accept the technology and system of Unmanned vehicles if there are road trials in Thailand					
26. I will embrace the technology and systems of driverless vehicles in the next 5 years.					
27. I think driverless vehicles will be practical.					

Part II: Demographic Information

28. Gender

- Male Female

29. Age

- Below 18 years old
 18 – 20 years old
 21 – 29 years old
 30 – 49 years old
 – 59 years old
 Above 60 years old

30. Education

- Below bachelor degree
 Bachelor degree
 Master degree
 Doctoral degree

31. Salary (monthly Income)

- Below 9,000 Baht
 9,001 – 10,000 Baht
 10,001 – 30,000 Baht
 30,001 – 50,000 Baht
 50,001 – 70,000 Baht
 70,001 – 90,000 Baht
 90,001 – 120,000 Baht
 120,001 – 150,000 Baht
 Above 150,001 Baht

32. Media Channel

- Online Media Channel (Website, Blog, YouTube, Twitter, etc.)
 Television/ Digital poster/ Radio
 Offline Media channel (Newspaper, Magazine, Infographic)