A STUDY OF MALAYSIANS' INTENTIONS IN USING RFID TAG AS AN ELECTRONIC PAYMENT

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DECLARATION

We hereby declare that:

(1) This undergraduate FYP is the end result of our own work, and that due acknowledgement has been given in the references to ALL sources of information be they printed, electronic, or personal.

(2) No portion of this FYP has been submitted in support of any application for any other degree or qualification or any university, or other institutes of learning.

(3) Equal contribution has been made by each group member in completing the FYP.

(4) The word count of this research report is 20,173 words.

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DEDICATION

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TABLE OF CONTENTS

LIST OF TABLES

Page

LIST OF FIGURES

Page

LIST OF ABBREVIATIONS

AT	Attitude
ATM	Automated Teller Machine
AVE	Average Variance Extracted
BNM	Central Bank Malaysia
CA	Cronbach's Alpha
CR	Composite Reliability
DTPB	Decomposed Theory of Planned Behaviour
E-CASH	Electronic Cash
E-FD	Electronic Fixed Deposits
E-IPO	Electronic Initial Public Offerings
ERP	Electronic Road Pricing
E-TAG	Electronic Tag
E-TALL CARD	Electronic-Toll card
ETC	Electronic Toll Collection
E-WALLETS	Electronic Wallets
E-WOM	Electronic Word of Mouth
FOMCA	Federation of Malaysian Consumers Associations
GDP	Gross Domestic Product
GPS	Global Positioning System
GS	Government Support
HTMT	Heterotrait-Monotrait

LIST OF ABBREVIATIONS

ITS	Intelligent Transport System
ITU	Intention to Use
JPJ	Malaysia Road Transport Department
M	Sample Mean
MLFF	Multi-Lane Free Flow
NSE	North-South Expressway
O	Original Sample
O/STDEV	T-Statistics
OBU	On-Board Unit
PEU	Perceived Ease of Use
PLS	Partial Least Squares
PLS-SEM	Partial Least Squares Structural Equation Modelling
PLUS	PLUS Expressways Company
PU	Perceived Usefulness
PR	Perceived Risk
RFID	Radio-Frequency Identification
RSSB	Rangkaian Segar Sdn Bhd
SEM	Structural Equation Modeling
SI	Social Influence
SM	Social Media
STDEV	Standard Deviation

LIST OF ABBREVIATIONS

TAM	Technology Acceptance Model
TNG	Touch 'n Go
TPB	Theory of Planned Behaviour
TRA	Theory of Reasoned Action

LIST OF APPENDICES

Page

PFEFACE

The rise of electronic payment systems has revolutionized the way people pay for goods and services, and Malaysia is no exception. In recent years, electronic payment methods such as e-wallets and credit or debit cards have gained popularity over traditional cash payments. To keep up with technological advancements, Malaysia has introduced various cashless payment methods, including Radio-Frequency Identification (RFID) tags. RFID tag payment deducts the amount paid directly from the TNG e-wallet after scanning the RFID tag. As of today, RFID tags can be used in Malaysia for toll collection and payment at petrol stations. However, despite its potential benefits, the adoption rate of RFID tag payment in Malaysia remains low.

This research project aims to investigate the factors that influence Malaysians to use RFID tags as a payment method. The research is based on primary data collected through a survey of 400 respondents across Malaysia. The survey instrument was designed to measure several factors that could affect the Malaysians' intentions to use RFID tag payment, including perceived ease of use, perceived usefulness, social influence, attitude, social media, and government support.

In conclusion, this research project will provide valuable insights into the determinants of intention to use RFID tag payment among Malaysians. The research's findings can assist policymakers and industry players in designing and implementing more effective payment systems that meet the needs of consumers and promote the adoption of new payment technologies. By understanding the factors that affect intention to use RFID tag payment, Malaysia can continue to progress technologically and remain competitive in the global market.

ABSTRACT

In recent years, the Malaysian government has introduced RFID technology to replace the existing toll payment system. However, the adoption rate of RFID among Malaysian drivers is still low. This research investigates the factors that influence Malaysian drivers' intentions to use RFID as a payment method on highways using the Technology Acceptance Model (TAM) and Theory of Planned Behaviour (TPB). The research identifies six independent variables that may influence drivers' intentions toward RFID, including perceived ease of use, perceived usefulness, social influence, attitude, social media, and government support. A total of 400 questionnaires were collected, and the data underwent various statistical analyses including outer loadings analysis, reliability testing, discriminant validity testing, and bootstrapping. The results show that only perceived ease of use, perceived usefulness, and attitude have a positive and significant relationship with the intention to use RFID. Conversely, social media, social influence, and government support do not significantly influence intentions. The research suggests that merchants consider implementing RFID technology to enhance their services, and TNG Company should improve the user-friendliness, efficiency, and convenience of the technology. Additionally, the government can indirectly influence drivers' intention to use RFID by encouraging collaboration between SMEs and TNG Company, offering free installation services, and establishing a legal framework to enforce fraud and bad toll payment situations. The research acknowledges some limitations, including the sample size bias, the differences in RFID system availability across regions, and the framework's inability to measure actual usage behaviour. To improve future research, it is needed for a more representative sample across different age ranges, focusing on specific subgroups within the population, incorporating measures of actual usage behaviour, considering contextual factors, and conducting a comprehensive literature review. By addressing these limitations, researchers can produce more valuable insights that are applicable to the nation and population being studied.

CHAPTER 1: RESEARCH OVERVIEW

1.0 Introduction

The first chapter of this research will outline the aims of investigating Malaysian drivers' intentions to use RFID technology as a highway payment method. This chapter discusses the research background, problem statement, research questions, research objectives, and research significance.

1.1 Research Background

1.1.1 Digitalization

Digitalization is one of the major trends reshaping business and society by converting analog information into digital form, enabling easy storage, transmission, and processing using computers and digital devices. People, organisations, and countries can alter their traditional practices and take on new roles by adopting digital technologies (Parviainen et al., 2017). From an economic perspective, digitalization increases productivity and provides better goods and services, thereby contributing to a rise in the country's gross domestic product (GDP). The digital economy in Malaysia is anticipated to contribute 22.6% of its GDP and generate more than 500,000 job possibilities by 2025, according to Science, Technology, and Innovation Minister Datuk Seri Dr Adham Baba (Azizul Ahmad, 2022). In short, digitalization is an indication of a country's technological development.

In this research, the digitization of toll payments in Malaysia is the primary focus. Due to this innovation, Malaysians can use Touch 'n Go (TNG) e-wallets and Radio-Frequency Identification (RFID) tag technology for many

purposes. This innovative payment method has made it more convenient for Malaysians to pay tolls and has also expanded to other areas such as parking as early as 2020. For example, once a car is fitted with an RFID tag, the car drivers can pay for parking without having to roll down their windows for a ticket or scan TNG for the payment. Additionally, RFID can be used as a payment method when refuelling a car (Vernon, 2020). The number of Shell petrol stations accepting RFID for payment in Malaysia has grown from 5 to 88 in just two years (Ignatius, 2022). Thus, RFID has emerged as a popular cashless payment innovation with the potential to be widely used by Malaysians.

1.1.2 Electronic Toll Collection System

Transportation capacity is strained by rising travel and commodity demand, causing severe highway congestion in countries. Traditional transportation tactics are no longer efficient due to increasing congestion, particularly at toll plazas. Authorities recognize the need for faster, more practical, and technology-related solutions to improve transportation systems. According to Dr Sawal Hamid, the successful implementation of the Electronic Road Pricing (ERP) system in Singapore since 1998 has resulted in a reduction in traffic congestion ("*E*xperts Urge Authorities to Improve RFID Technology Immediately", 2022). Hence, electronic toll collection (ETC) systems, an integrated part of Intelligent Transport System (ITS), are becoming popular in many countries, including Malaysia, following Singapore's success.

ETC system allows toll plazas to be collected electronically without cash or manual intervention, automatically charging users' accounts as they pass through a toll plaza using technologies like RFID, GPS, and wireless communication. Users must link a payment method such as a prepaid card, bank account, or credit card to their accounts when using the ETC system. When a vehicle with an ETC device passes through a toll plaza, the system automatically detects it and debits the toll amount from the user's account.

This system also allows for the tracking of toll transactions and provides users with a comprehensive record of their toll usage.

Table 1.1

Summarised of ETC System in Several Asian Countries

Country	Tools of Passing Toll	Toll Payment
China	E-serve, Hutong Card, Zhejiang ETC Card, etc	Prepaid card, debit card, credit card, Alipay and WeChat Pay
Hong Kong	Auto toll	Prepaid card
South Korea	Hi-pass System	Prepaid (top-up from bank or credit card)
Taiwan	eTag	eTag prepaid account
	License plate recognition	Mail statement and make payment at chain convenience store
India	FASTag (RFID)	Prepaid or debit from Saving Account
Indonesia	e-Toll card	e-Toll Prepaid Account or Postpaid Account
Philippines	AutoSweep RFID and Easytrip	Prepaid Account
Singapore	Electronic Road Pricing	CashCard/ Autopass card
Thailand	Easy Pass	Prepaid Card
	M-flow (cashless tolling)	Postpaid System

Malaysia	Smart TAG and Touch 'n GO	Prepaid Card
	RFID	Direct Debit from TnG eWallet

Source: Designed for the research

Table 1.1 summarizes the payment methods used by several Asian countries for their ETC systems. It demonstrates a trend where almost every country is adopting ETC as the favoured mode of paying tolls. In nearly all Asian countries, prepaid cards are utilized as a payment method for tolls, except for China and Malaysia, where drivers have the option to pay tolls directly using e-wallets. The system of paying tolls directly through e-wallet can be considered a revolutionary development. Thus, this research will explore the factors affecting the intentions of Malaysian drivers to adopt the new technology (RFID) in place of the current technologies (SmartTag and Touch 'n Go).

1.1.3 History of Toll Payment

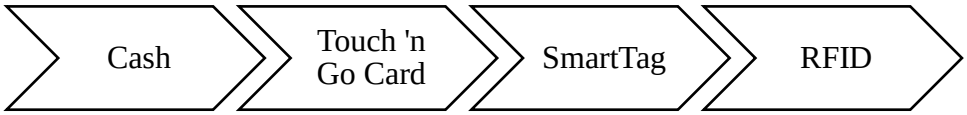


Figure 1.1. History of Toll Payment in Malaysia.

Since 1996, the first tolled highway has been opened to traffic in Malaysia. The toll payment system has transformed from manual cash payments to digital cashless payments. The payment methods for tolls start with cash payment, followed by a Touch 'n Go (TNG) Card, SmartTag, and currently, Radio Frequency Identification (RFID). In the past, toll plazas used manual toll collection, where drivers had to pay the operators in cash, and transactions would be manually recorded into the toll collection system (Abu Bakar Hashim, 2006). However, this payment method contributes to

heavy traffic congestion as the drivers must stop their cars, hand over cash to the operators, and wait for the calculations.

Traffic congestion is a contributory push factor in electronic toll collection (ETC) system development. In 1994, the first ETC system was introduced by North-South Expressway (NSE) which was marketed as PlusTag (Ismail Salleh et al., 2006) One year after the opening of the first Malaysian toll highway in 1995, the ETC system was implemented using a proximity card approach. This system utilized a smartcard called BridgeKAD, which was used at Penang Bridge Toll Plaza from 1995 to 2000 (Abu Bakar Hashim, 2006). It was stated that the TNG cards, using similar technology, replaced BridgeKAD in 2000 and have been in use ever since.

In 1998, the SmartTag was introduced by Rangkaian Segar Sdn Bhd (RSSB), which was upgraded to a two-piece tag consisting of a TNG card and an on-board unit (OBU). However, it is only applicable to the passenger car (Ismail Md Salleh et al., 2006). At the time, smart tags were considered the quickest payment method for tolls in Malaysia before the implementation of RFID. The driver only takes about three seconds to pass through SmartTag's dedicated lanes and pay the toll without stopping. Hence, the SmartTag lanes are available on most of the expressways. However, the price of SmartTag is higher compared to other payment methods with a minimum of RM127.20 per unit exclusive to the TNG card.

As of 8 August 2018, TNG company discontinued the sales of SmartTag devices and rolled out Radio Frequency Identification (RFID) (Chan, 2022). Starting in September 2018, TNG launched an RFID pilot programme for the public who are interested to the system. During the pilot phase, the RFID system will be tested and improved to ensure that it operates effectively and efficiently, before being implemented on all highways throughout Malaysia (Nair, 2018). This system will use a sticker embedded with the radio frequency chip that can be affixed to the car's windscreen or headlamp.

Additionally, the cost of the RFID sticker is lower than that of the SmartTag device, which is priced at RM35 and only can link to a specific vehicle (Yeoh, 2020). The system will be integrated with the TNG e-wallet, enabling users to monitor and recharge their balance through online banking, debit cards, or credit cards (Azanis Shahila Aman, 2022). In addition, the RFID system does not rely on battery power, which can potentially save users the cost of replacing the battery regularly. However, it must be noted that this payment method is only applicable to passenger cars. Thus, PLUS Malaysia Berhad is planning to expand the use of RFID for toll payments to include heavy vehicles such as buses and lorries (Azanis Shahila Aman, 2022).

Table 1.2

Advantages And Disadvantages of Toll Payment Methods

Method	Advantages	Disadvantages
Cash	- Low construction cost as it only requires minimal equipment and a toll operator. - Tollgate area can be small as there is no complicated devices required.	- It takes longer process as drivers have to stop their cars and pay cash to the toll operator. The operator then has to calculate the total and return change to the driver. - It often causes traffic congestion at toll plazas as it takes longer for drivers to pay their tolls. - There is a higher risk of toll collectors making errors when

		giving change to drivers.
Touch 'n Go Card (Prepaid Card)	- Paying the toll fare is fast and convenient with no need to fumble for cash. - Low-cost option for drivers as no special device is needed. - The number of toll operators is greatly reduced as drivers can pay the toll fees by scanning their card. - Touch 'n Go card can be used in parallel with manual collection by tapping the card on the scanner at the toll plaza.	- Small traffic capacity of tollgate compared to SmartTag and RFID. - There is a risk of unauthorized usage if the card is stolen or lost, as third parties can make transactions with just one tap on the reading machine.
SmartTag	- The payment process is faster compared to Touch 'n Go card as it uses contactless payment. - Traffic congestion in toll plazas can be reduced. - Toll operator is not needed as the system is fully automated.	- High-cost option for drivers as it requires a special device to be installed in the vehicle.

RFID Tag	- The payment process is faster compared to SmartTag as driver no need to hold or wave the device. - It can be topped up easily, manually, and automatically as it is linked to the e-wallet (Lye, 2022). - Traffic congestion in toll plazas can be reduced due to its fast access (Mehendale & Masurekar, 2015). - Toll operator is not needed as the system is fully automated. - RFID tags are more cost-effective than SmartTag devices as they do not require batteries or additional devices (Lye, 2022).	- RFID tags may not be detected by the readers if the drivers are driving too fast (Lye, 2022). - RFID users must only use the designated RFID lanes on PLUS highways and are not allowed to mix the lanes (Wong, 2022).

Source: Designed for the research

Table 1.2 indicates the toll collection payment methods used by Malaysians. Each payment method has its advantages and disadvantages, so Malaysian drivers can choose the option that suits them best in terms of convenience.

1.1.4 Electronic Toll Payment Users in Malaysia

Toll plazas in Malaysia have gone fully electronic, with Touch 'n Go (TNG) and SmartTag lanes allowing drivers to pay toll fares without handling cash. Beginning on 26 April 2017, no more cash will be acceptable in a total of 94 toll plazas under the North-South Highway (PLUS) (Babulal, 2017). All the PLUS highway users are allowed to pay tolls via PLUS Miles card, TNG card, and SmartTag. After three months, there is 158 out of 177 toll plazas accept cashless payments. However, sales and reload lanes for TNG remain accessible for the public to purchase or top up their electronic card upon entering highways (Babulal, 2017).

PLUS introduced RFID technology in 2018 as part of Malaysia's plan to implement the Multi-Lane Free Flow (MLFF) system by 2025 (Wong, 2021). They cooperated with the TNG company to roll out the TNG RFID to modernize toll payments and reduce congestion at toll plazas. The Malaysian Highway Authority reveals that the number of vehicles fitted with RFID reached 1.29 million as of 31 December 2020 (Lembaga Lebuhraya Malaysia, 2020). The Malaysian Reserve reported that they are successful to implement the RFID at a total of 83 toll plazas on North-South Expressway Juru Skudai, effective on 15 January 2022 ("RFID Toll Transactions on PLUS' Juru-Skudai Route Begins from 10pm Saturday", 2022).

Moreover, PLUS Malaysia Berhad (2022) also reported a 55% increase in RFID customers on their highways since the introduction of Touch 'n Go RFID on the North-South Expressway on 15 January 2022. It can be seen that the use of RFID technology is to be more effective than the infrared technology used for SmartTag devices ("RFID Usage Increases 18pc", 2022).

Table 1.3

Comparison of Total Traffic Volume Using RFID for Toll Payment Between Years 2019 and 2020

Highway	Total Traffic (Millions)		Total Increase in Traffic (Millions)
	Year 2019	Year 2020	
LUS	0.70	1.87	1.17
KESAS	5.93	8.45	2.52
KLK	1.23	1.86	0.63
SPDH	0.15	0.40	0.25
LINKEDUA	0.72	2.09	1.37
BKE	0.77	2.55	1.78
GRANDSAGA	2.76	4.23	1.47
LDP	8.54	12.95	4.41
BESRAYA	2.96	4.36	1.40
AKLEH	0.63	0.93	0.30
SPRINT	3.95	5.55	1.60
NNKSB	0.96	1.73	0.77
NPE	4.38	5.24	0.86
SILK	3.80	5.57	1.77
GCE	1.87	2.64	0.77
LLB	0.74	1.94	1.2
SMART	0.24	0.41	0.17
MEX	3.26	4.06	0.80
DUKE	4.62	6.40	1.78
LEKAS	0.003	0.17	0.17
LKSA	1.83	2.59	0.76
KLKS	0.87	1.65	0.78
JSAHMS	0.11	0.26	0.15

JPP	0.02	1.02	1.00
TOTAL	**51.04**	**78.92**	**27.88**

Note. From Lembaga Lebuhraya Malaysia. (2020). *Laporan Tahunan 2020.*

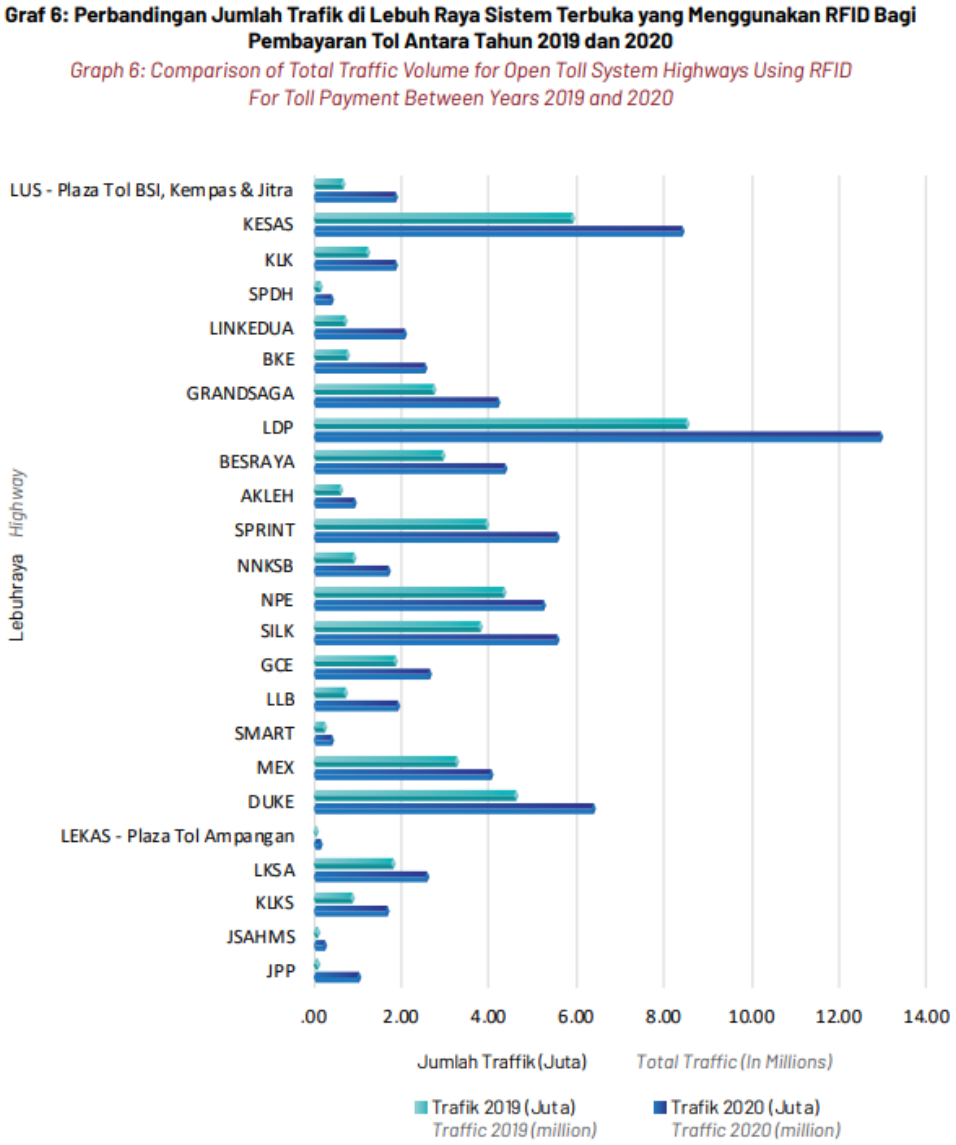


Figure 1.2. Comparison of Total Traffic Volume Using RFID for Toll Payment Between Years 2019 and 2020. Adapted from Lembaga Lebuhraya Malaysia. (2020). *Laporan Tahunan 2020*.

Table 1.3 and Figure 1.2 present a comparison of total traffic volume using RFID on toll roads in Malaysia between the years 2019 and 2020 that

published by the Malaysian Highway Authority in its latest annual report. The use of RFID services has shown a significant increase of 54.62% or 27.88 million vehicles in 2020 compared to 2019. This growth can be attributed to the fact that by 2020, all open toll system highways had adopted the RFID toll collection system as one of the payment methods.

1.1.5 Behavioural Intention to Use

Behavioural intention refers to an individual's deliberate desire to perform or refrain from carrying out specified behaviours (Brezavšček et al., 2017). It is a fundamental concept in social psychology that describes the cognitive state that leads to behaviour. Behavioural intention is commonly used to predict and understand consumers' behaviours toward a particular product or service. Technology Acceptance Model (TAM) and Theory of Planned Behaviour (TPB) are often used to examine the behavioural intention to use new technology. The combination of TAM and TPB will result in perceived ease of use, perceived usefulness, social influence, and attitude serving as indicators of behavioural intention. Also, two external variables including social media and government support will be incorporated to determine their influence on the intentions of Malaysian drivers to use RFID. In short, the objective of this research is to examine the intentions of Malaysian drivers in using RFID as one of the cashless payment methods with TAM and TPB.

1.2 Research Problem

This research goal is to figure out the elements affecting the "intentions to use Radio Frequency Identification (RFID) as an electronic payment" among Malaysian drivers. Elements such as Perceived Ease of Use, Perceived Usefulness, Social Influence, Attitude, Social Media, and Government Support have a crucial role in influencing Malaysian drivers' intentions to adopt new financial technologies.

As of the 21st century, the development of a country is reliant on its transportation infrastructure (Raed Abdulla et al., 2018). The problem of traffic congestion is becoming more significant in several metropolitan regions (Fong et al., 2019). The rapid integration of technology into transportation services has contributed to the acceleration of economic growth and has provided significant advantages to society. As technology advances globally, consumer payment activities have undergone significant transformations through rapid advancements in information technology. Numerous innovative payment technologies such as Touch 'n Go, SmartTag, and RFID have been invented and utilized for electronic toll collection services. The Malaysian Highway Authority has accelerated the development of a Multi-Lane Free Flow (MLFF) by implementing a new RFID-based system at toll plazas to relieve traffic congestion (Waqas Ahmed et al., 2020).

As an alternate toll payment option, RFID was first implemented on Malaysian highways in September 2018 and is anticipated to be completely adopted by the end of 2023 (Wong, 2021). At the same time, the ministry intends to stop issuing TNG and SmartTag cards as forms of electronic toll payment (Foong, 2021). By the end of 2022, the Malaysian governments aspire to raise RFID adoption by 60%, and by the end of 2023, it will be at 100% (Lim, 2021). However, it was observed that only a small proportion, specifically 10% of highway users adopted RFID technology after it was introduced in 2022 (Tan et al., 2022). It is apparent that there is a lack of enthusiasm for transitioning from TNG and SmartTag cards to RFID Tag among Malaysians, mainly due to their limited awareness of the advantages that RFID offers.

The Malaysian governments offered a three-month promotion from January 5 to March 31, 2022, giving Malaysians an RM10 discount when purchasing RFID tags through e-wallets to encourage the usage of RFID ("Govt Targets 60% RFID Use For Toll Payments By End 2022", 2021). Governments play a significant role and its ongoing support is essential in affecting Malaysian drivers' to use RFID. Therefore, governments have recently been looking into ways to offer further incentives, such as pre-installing RFID in new cars. Thus, it can be noted that government initiatives and encouragement greatly assist in enhancing the adoption

of RFID. However, there are now hardly any studies that cover how governments influence Malaysians' intentions to use RFID.

Furthermore, Malaysian drivers must stop their cars at the toll plazas to make the payment as TNG and SmartTag cards have a limited transmission range. In a contract, the new RFID lanes allow Malaysians to enjoy a smoother journey with contactless payment at toll plazas. Nevertheless, a number of Malaysians have expressed that they would still prefer to use SmartTag rather than RFID technology for their toll transactions ("Experts Urge Authorities to Improve RFID Technology Immediately", 2022). The reason is that a compilation of negative feedback has been received by the Malaysian Highway Authority such as double charges, e-wallet crashes, slow scanning and reading speeds, and traffic congestion caused by the system showing that payment has been charged but users cannot pass through toll plazas. The aforementioned reasons lead to the Malaysian drivers' preferences to use TNG or SmartTag, affecting their intentions to switch to RFID.

Moreover, another barrier of the adoption and utilization of RFID technology is the technical issues with RFID. RFID reader and tag frequently collide, resulting in the toll payment cannot be completed and traffic congestion on highways occurring. Malaysian drivers waste time on the highways due to technical problems, which leads to dissatisfaction among them. According to the PLUS Strategic Stakeholder Engagement, staff members with handheld devices have been assigned at toll plazas when the RFID technology cannot be detected. This results in Malaysian drivers lose their intentions of using or switching conventional payment methods to RFID due to its technical issues. Technical problems with RFID regularly arise due to the immaturity of the RFID technology as Malaysia is still in the early stages of adopting RFID.

Nowadays, RFID technology has become a popular payment method on highways in Malaysia, replacing traditional toll collection methods. However, Suhaiza Zailani et al. (2010) noted that Malaysia has been lagging behind other countries like Australia, the United States, and the United Kingdom in adopting RFID even though it offers several advantages such as faster and more convenient transactions, reducing traffic congestion, and improving safety. There is an ignorance of the

perspective of Malaysian drivers but primarily focused on Malaysia's perspective towards RFID. Hence, the research paper aims to explore the factors affecting intentions of Malaysian drivers toward RFID based on a modified Technology Acceptance Model (TAM) and Technology Planned Behaviour (TPB) (Irawan et al., 2016).

1.3 Research Questions

This research paper aims to explore the questions below:

1. Is there any significant relationship between perceived ease of use and Malaysian drivers' intentions toward RFID?
2. Is there any significant relationship between perceived usefulness and Malaysian drivers' intentions toward RFID?
3. Is there any significant relationship between social influence and Malaysian drivers' intentions toward RFID?
4. Is there any significant relationship between attitude and Malaysian drivers' intentions toward RFID?
5. Is there any significant relationship between social media and Malaysian drivers' intentions toward RFID?
6. Is there any significant relationship between government support and Malaysian drivers' intentions toward RFID?

1.4 Research Objectives

The objective of this research paper is to identify the relationship between perceived usefulness, perceived ease of use, social influence, attitude, social media, and government support on Malaysian drivers' intentions to use RFID as a highway payment method. A minimum of 384 Malaysian respondents will be selected for this research (Krejcie & Morgan, 1970).

1. To evaluate the relationship between perceived ease of use and Malaysian drivers' intentions toward RFID.
2. To evaluate the relationship between perceived usefulness and Malaysian drivers' intentions toward RFID.
3. To evaluate the relationship between social influence and Malaysian drivers' intentions toward RFID.
4. To evaluate the relationship between attitude and Malaysian drivers' intentions toward RFID.
5. To evaluate the relationship between social media and Malaysian drivers' intentions toward RFID.
6. To evaluate the relationship between government support and Malaysian drivers' intentions toward RFID.

1.5 Research Significance

This research will benefit the governments, merchants, and technology companies as well as the general public. With the increasing number of automated technologies nowadays, governments and society are looking for more efficient and convenient ways to collect and make toll payments on highways. This also opens up business opportunities for involved technology companies.

With the aid of this research, Malaysian governments can understand the switching barriers from Touch 'n Go (TNG) to RFID Tag as a payment method on highways. In the research from Lim (2021), governments aim to reduce toll stations and lanes for TNG and SmartTag by 2022. After the announcement was made, there was concern that TNG and SmartTag options will be entirely terminated in 2023. However, the public is still hesitant to switch to RFID as they continue to have their doubts. Thus, governments must fully comprehend the factors influencing public decisions regarding RFID payments to encourage adoption. This research can help identify resistance to promoting RFID technology and suggest measures to improve public acceptance. The findings can guide the governments in promoting the use of RFID technology effectively, avoiding wasted time and resources.

Besides, this research may assist small, medium, and large firms such as restaurants, shopping malls, and petrol stations in developing their operations. TNG and Shell Malaysia are collaborating to launch an RFID refuelling pilot project at selected Shell gas stations (Wong, 2022). Currently, there are 88 Shell stations that allow RFID payment. This adoption of RFID payment in gas stations is a good sign for the development of RFID technology in various industries. For instance, shopping malls using RFID in parking payment systems can save time and labour costs for managing the parking lots. Additionally, restaurants like McDonald's can use RFID technology to provide takeaway services, where consumers can directly deduct the bill amount from their TNG wallet by scanning RFID readers at the takeaway lane. Therefore, various sectors in Malaysia can take advantages of RFID technology to expand their services. Businesses can use the information gathered from this research to take the initiative of RFID technology in payment systems by anticipating market needs and making proactive changes.

Moreover, the technological firms that have been working on the advancement of electronic payments benefit from this research. They can obtain the information about attitudes and expectations of Malaysian drivers regarding RFID technology. The relevant firms can more effectively modify the technology by resolving the technical issue after receiving feedback from the respondents in this research. With this, they can improve the development of RFID and meet the users' expectations. This research can provide valuable insights for technology companies on the specific variables related to RFID payment methods that the public is most sensitive to.

Furthermore, the public can better understand the adoption of RFID as a payment method from this research. A comparison of highway payment methods such as TNG, SmartTag, and RFID Tag will be given in this research as a reference for the public to select the one they like for their highway payment. With the table sorting out the advantages and disadvantages of highway payment methods, it is plausible that the public intends to utilise RFID as it offers several advantages. Additionally, this research raises public awareness regarding the advancement and application of the RFID system. In this way, the public will generate better judgments due to the

improvement in their awareness of highway payment methods. The public can express their opinions to the technology companies or governments to urge them to make products and services that better meet their needs.

Finally, future researchers can apply the findings from this research to enhance their studies by obtaining academic experience. The results can help them to examine more detailed information about how to influence Malaysian drivers to utilise RFID for highway payments. The researchers can develop a clearer mindset on the factors influencing Malaysian drivers in using RFID as a highway payment method. The factors included are perceived ease of use, perceived usefulness, social influence, attitude, social media, and government support. It is conceivable that the researchers can gather relevant information from this research as there is a lack of information and research related to the use of RFID at this moment.

1.6 Conclusion

Chapter one will present a comprehensive summary, which includes the research background, research problem, research questions, research objectives, and research significance. In addition to discussing the support from the Malaysian government for highway toll payment (RFID), it also covers the application scenarios of digitalization, introduction of electronic payment, history of highway toll payment methods, and a brief introduction to the highway toll payment methods in Asian countries. Further detail on dependent and independent variables were addressed in the following chapter.

CHAPTER 2: LITERATURE REVIEW

2.0 Introduction

Chapter two involves an overview of prior research on RFID and a comprehensive analysis of the literature review with respect to the research objectives outlined in chapter one. The relevant theories that underpin the research framework will be presented at the start of this chapter. The subsequent section will delve into the dependent and independent variables, followed by the development of hypotheses.

2.1 Underlying Theories

This research is supported by two theories: the Theory of Planned Behaviour (TPB) and the Technology Acceptance Model (TAM).

2.1.1 Technology Acceptance Model (TAM)

Many researchers have investigated and identified the dominant variables that affect the consumers' intention to use the innovation through different models. Among the models, Technology Acceptance Model (TAM) is well explained the effect of variables on the consumers' behaviours and intentions toward the adoption of new technology (Cham et al., 2018). TAM was first proposed by Davis (1989) which is the main and basic model that has been extensively used by researchers in different fields such as electronic payment (Hartini Azman et al., 2012; Phurkwattanakul & Methavasaraphak, 2021; Md Wasiul Karim et al., 2020); mobile banking (Luarn & Lin, 2005; De Leon, 2019; Ho et al., 2020); toll collection system (Jou et al., 2011; Chen et al., 2007)); social networks (Muhammad Alshurideh et al., 2019; Salloum et al., 2018; Kim, 2012) and other business

operations based on different digital platforms. Evidently, this theory has always been used by many researchers because it is a simple and easy implication model which provides a lot of useful information to technology consumers.

TAM suggests that perceived ease of use and perceived usefulness are the two main determinants that affect the adoption of an information system (Shaizatulaqma Kamalul Ariffin & Khor, 2020). The first determinant, perceived ease of use is defined as the degree to which the users think that using the particular technology or system will enhance their performance (Cham et al., 2018). The second determinant, perceived usefulness refers to the degree to which the users think that using the technology will be free of effort (Gao & Bai, 2014). Based on the TAM, both perceived ease of use and perceived usefulness have a direct effect on the attitude of the consumers which in turn influence their intention to use the new technologies.

Although the TAM has been applied by many authors in different fields, some authors still found that the model provides a limited explanation of the factors affecting the consumers' intention to use the technology services (Patel et al., 2017; Chen et al., 2007). Thus, the authors would expand the model by including the other factors (Tan et al., 2022). These variables are known as external variables which were omitted from the initial model (Taherdoost, 2018). Muazzem Hossain and Prybutok (2008) also found that the variables of perceived usefulness, perceived ease of use, perceived security and perceived privacy significantly affect the adoption of RFID. In addition, the research from Mohammed Alamgir Hossain and Mohammed Quaddus (2011) expanded their model by including privacy and security in their model and found that it is significant to the adoption of RFID. They also have combined the perceived ease of use and perceived usefulness as perceived convenience of use. In this research, these two variables will be separated because the process of using the RFID for payment is more complicated as the consumers need to purchase the RFID tag, install, and

link it with the e-wallet application while the others study is focusing on the general RFID technology.

TAM has limitations related to measuring consumer behaviour subjectively using constructs such as behavioural intention and interpersonal influence (Malatji et al., 2020). However, social influence as a subjective norm refers to a situation when an individual is influenced by the "word of mouth" from his or her family, colleagues, and friends (Ajibade, 2018). Secondly, quantifying behaviour in an observational study is challenging due to subjective factors such as societal norms, individual traits, and personality attributes. Opinions from friends and family to pressure others into using technology may not be reliable or precise in the working environment (Malatji et al., 2020).

In short, Technology Acceptance Model (TAM) is a widely used model that has been utilised to establish the research framework in any area associated to technology acceptance. As a result, TAM can be used to investigate Malaysian drivers' intentions to use RFID in this research.

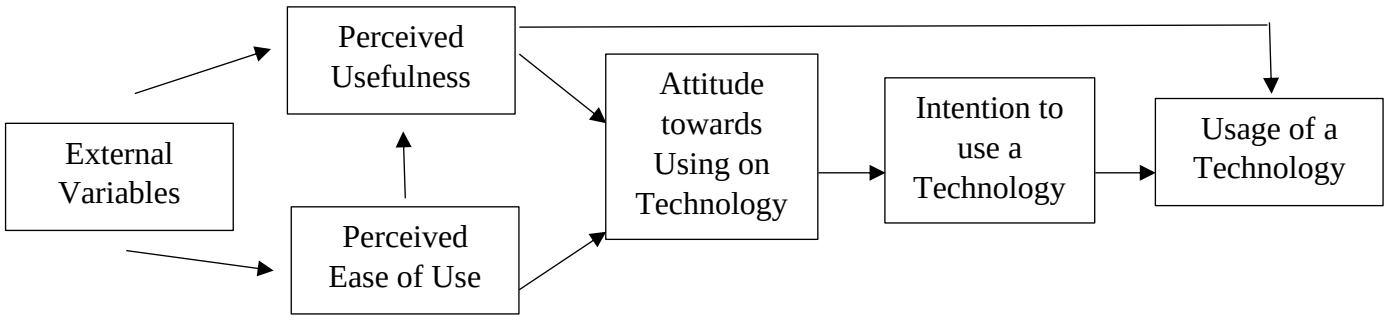


Figure 2.1. Technology Acceptance Model (TAM). Adapted from Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *Management Information Systems Quarterly*, *13*(3), 319.

2.1.2 Theory of Planned Behaviour (TPB)

Theory of Planned Behaviour (TPB) is created by Icek Ajzen in year 1985, and he described it in a chapter titled "From intention to action: A theory of planned behavior." (Ajzen, 1985). This theory was inspired by Theory of Reasoned Action theory (TRA), which was previously put out through Ajzen and Fishbein (1980). In other words, perceived behavioural control is a new dimension that the TPB adds to the TRA to take into consideration circumstances when a person has little or no influence over the desired conduct (Ajzen, 1991). In brief, the TPB theory is used to forecast and comprehend human behavioural intentions, which are impacted by a confluence of attitudes, subjective norms, and perceived behavioural control.

Attitude is a crucial variable in TPB that can have a positive or negative impact on an individual's intention to engage in a specific behaviour (Ajzen, 1987). It strongly shapes verbal responses and observable behaviours, and its influence on behavioural intention is closely linked. Consumer behaviour is highly influenced by personal attitudes, which have a significant impact on an individual's behaviour (Gopi & Ramayah, 2007; Ünal et al., 2011). Thus, TPB predicts that individuals are more likely to plan to engage in an activity if they have a favourable attitude towards it.

The second variable of TPB is subjective norm, which refers to an individual's perception of the beliefs of significant others about whether they should engage in a particular behavior (Ajzen & Madden, 1986). An individual's intention is directly proportional to the perceived importance of others' views on their behavior (Ajzen & Fishbein, 1980). Therefore, subjective norms are a critical factor in predicting behavioral intentions, particularly during the initial adoption stage of new technologies like RFID, where external pressures can significantly influence acceptance (Shaizatulaqma Kamalul Ariffin & Khor, 2020).

Moreover, perceived behavioural control is another variable in TPB that refers to an individual's perception of their ability to maintain control over their behavior. (Lai, 2017). In essence, an individual's intention is influenced

by their perception of how difficult it is to execute their behavior or their perceived volitional control (Ajzen & Madden, 1986). In short, when there are fewer anticipated obstacles or barriers, an individual's intention to use new technologies will increase as their perceived level of behavioral control will be higher.

Furthermore, the TPB has limitations as some variables are not consciously considered. In this situation, even if an individual does not express a certain attitude, it may still have an impact on their choices (Sansom, 2022). Hence, Taylor and Todd created the Decomposed Theory of Planned Behaviour (DTPB), which incorporates Innovation Diffusion Theory, TPB and TAM to predict human behaviour more accurately (Taylor & Todd, 1995). For example, Tao and Fan (2017) use DTPB model to investigate factors that influence users' intentions towards electronic toll collection services.

Lastly, a number of researchers have integrated TAM and TPB to analyze the behavioural intentions of new technologies in an effort to minimize the constraints of TPB (Belanche et al., 2022; Luarn & Lin, 2005; Irawan et al., 2016; Peong et al., 2021). Hence, both TAM and TPB are employed to examine the Malaysian drivers' intention to use RFID in this research.

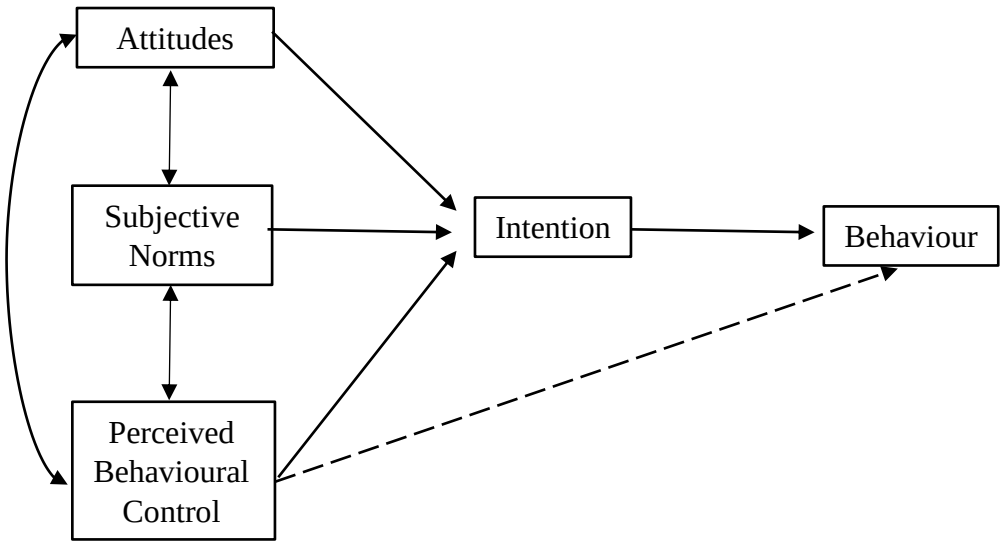


Figure 2.2. Theory of Planned Behaviour (TPB). Adapted from Ajzen, I. (1985). From intentions to actions: A theory of planned behavior. In *Action control*, 11-39. Springer, Berlin, Heidelberg.

2.2 Review of Variables

2.2.1 Intention to Use (ITU)

Intention to use a new service or product effectively refers to customer's desire and readiness to perform certain action or behaviour (Aydin & Burnaz, 2016). It can also be defined as a customer's intention to carry out a plan of action (Zhao & Md Nor Othman, 2011). If someone wants to accomplish something or is interested in doing it, they will act. In research from Faruq and Hartini Ahmad (2014), they claimed that behavioural intention is the most critical factor in predicting actual behaviour. They asserted that a user's intention is the most significant determinant in determining whether or not they will accept and use technology, such as electronic payment methods. Behavioural intention is a self-reported likelihood of an individual purchasing a product or service within a specific time frame. Muhammad Haidhar Ibrahim et al. (2019) and Davis et al., (1989) defined behavioural intention as the decision-making awareness that motivates a person to engage in a particular behaviour.

According to Tan and other researchers (2022), most Malaysians fail to recognize the convenience and effectiveness of utilizing RFID technology. The majority of Malaysians do not acknowledge the efficiency and simplicity of the use of RFID for electronic toll collection systems due to the prevalence of several negative comments ("RFID toll payment gets mixed reactions from consumer groups", 2022). Referring to Tan et al. (2022), it was noted that just 10% of highway users switched to RFID once it had been introduced on January 15, 2022, whereas the majority of

Malaysians prefer Touch 'n Go and SmartTag as their toll payment methods. It is clear that the cognitive assessment of RFID affects how consumers form their intentions and attitudes toward using it.

Currently, the widespread use of RFID shows positive development for the economy in Malaysia. As Malaysia is still in the infant stage of a cashless society, the government intends to increase the "behavioural intention to use RFID" in Malaysia's society. According to a review of the literature on earlier studies, there are several variables that can be used to quantify behavioural intentions toward adopting technology, including perceived ease of use, perceived usefulness, and social influence. To be more specific, external variables include attitude, social media, and government support will be incorporated to better understanding the determinants to affect Malaysian drivers' intentions toward RFID.

2.2.2 Perceived Ease of Use (PEU)

Perceived ease of use (PEU) is a fundamental term in technology acceptance research, which related to the extent to which users believe that a certain system or technology is easy to use or requires minimal effort to accomplish a given task (Davis, 1989). Moore and Benbasat (1991) point out that perception of ease of use and the complexity of utilizing new technologies are equivalent. The Technology Acceptance Model (TAM) proposes that perceived ease of use has a significant impact on users' perceptions of the technology's usefulness, which, in turn, influences their intention to use the technology. Hence, understanding the concept of perceived ease of use is critical for forecasting and encouraging user willingness to embrace novel technologies.

According to the research of Teo et al. (1999), it indicates that the perceived ease of use of a system can impact its usage dimensions by affecting the perceived usefulness. This means that if a system is easy to use, users are

likely to feel more confident and motivated, which can lead to them exploring more of the system's features, resulting in a higher perceived usefulness. Additionally, such positive emotions may enhance intrinsic motivation, leading to increased enjoyment during system use. Furthermore, Chen et al. (2007) also demonstrated a significant positive effect of perceived ease of use on the perceived usefulness of the electronic toll collection (ETC) system in Taiwan, which is consistent with and supported by TAM theory.

Not only that, but several studies have also found that perceived ease of use has a direct effect on users' intentions to use technology. For example, the research from Nguyen and other researchers (2020) discovered that people are more likely to adopt the technology or continue using it when it is perceived as easy to use. This is because new technologies or systems that are perceived as easy to use may increase user confidence in their ability to be used effectively. This finding is consistent with other research that has shown that perceived ease of use is a key factor in predicting technology adoption (Chang et al., 2017; Lim & Cham, 2015; Chuang et al., 2016; Yeow et al., 2017; Lee, 2016).

In short, past research has demonstrated that people are more likely to adopt the technology or continue using it when it is perceived as easy to use. Therefore, the hypothesis of this research is that perceived ease of use is positively related to Malaysian drivers' intentions to use RFID as a highway payment method.

2.2.3 Perceived Usefulness (PU)

Davis (1989) defined perceived usefulness as the extent to which users believe that utilizing a particular technology or system will improve their performance. Based on the World Bank, RFID also can be defined as a financial technology product that allows for contactless payments. Research

has consistently shown that the perceived usefulness of a technology has a significant and positive effect on the intention to use the technology. Hartini Azman and other researchers (2012) discovered that perceived usefulness is the primary factor that influences users to adopt electronic payments in Malaysia. Most of the respondents agreed that adopting such systems would save them time and offer flexible payment options during purchases. This finding is consistent with previous studies such as Lee (2016) and Chuang et al. (2016).

Besides, a study on the acceptance of RFID toll payment among Malaysian highway users was conducted by Tan and other researchers (2022). Their research found that there is a significant relationship between the perceived usefulness with the customers' intention to use RFID. This is aligning with previous research by Suhaiza Zailani and other researchers (2015), who suggested that users prefer easy, effortless, and hassle-free RFID technology to improve their job performance.

Furthermore, Rachmad Hidayat and Sabarudin Akmad (2021) also obtained the same result as the previous studies. By using structural equation modeling, they analyze the implementation of RFID on E-toll in Indonesia. The research showed that respondents rated RFID as having significant benefits, including facilitating quick, accurate, and convenient transactions that are more efficient than cash. Thus, the higher the perceived usefulness of the RFID, the higher the degree of willingness for customers to use the RFID.

In short, past studies have demonstrated that perceived usefulness is significantly related to the behavioural intention to use the new technology. Therefore, the hypothesis of this research is that perceived usefulness is positively related to the Malaysian drivers' intentions to use RFID as a payment method in toll plazas.

2.2.4 Social Influence (SI)

Social influence encompasses the degree to which individuals within a social context have the ability to influence or shape the thoughts, actions, and attitudes of others (Teo et al., 2020). Social influence can also be referred to as subjective norms, social norms, or normative pressure. Individuals can exert a substantial impact on an individual's intentions include family members, friends, colleagues, and partners. Social influence indicates the extent to which individuals consider others' opinions to be influential when deciding whether to adopt a new technology. The adoption of RFID technology by people in one's immediate social circle, such as friends and family, could potentially affect its adoption by consumers.

Besides, Shen et al. (2013) noted that social influences from the community have an impact on how people accept new technologies. Lee et al. (2013) also expressed that there is a strong impact on adopting new technologies if most individuals in a community are effective at group acceptance. When social influence is being used, it refers to a person who might be impacted by the decision to adopt RFID or not. Even though these payment options require more time to complete and provide fewer promotions, the majority of Malaysians still utilise Touch 'n Go and SmartTag to make purchases. Therefore, it is conceivable that individuals can be persuaded to use RFID when people surrounding them such as parent, family, and friends start using RFID concurrently and acknowledge the advantages.

Social pressures from important individuals in an individual's life can impact their intentions, causing them to conform to the use of RFID technology. This is especially true if the influential people in their life have a positive attitude towards RFID. When subjective norms towards RFID usage are stronger, the likelihood of an individual adopting RFID technology also increases. Family members, friends, and romantic partners can persuade an individual to use RFID, leading to an increase in their behavioural intention towards it. Thus, it can be concluded that an

individual's tendency to use RFID is positively correlated with the level of subjective norms influencing their decision.

In other words, the adoption of RFID technology by consumers can be impacted by their environment. The most effective approach for promoting the highway authority's RFID services to friends and family members is the people who are utilising RFID in the area. Even though if some individuals are unfamiliar with the technology, they may be swayed by the opinions of their friends, family, and neighbours (Tan et al., 2022). However, Tan et al. (2014) discovered that users are not simply influenced by social status or group think and that their decision to adopt new technology is purely based on rational thought only.

In short, past studies has demonstrated that social influence has a varying result on the customers' behavioural intentions to use the new technology. Therefore, this research expects that there is a significant relationship between social influence and Malaysian drivers' intentions toward RFID.

2.2.5 Attitude (AT)

Attitude is a crucial component of consumer behaviour literature and holds significant importance in the Theory Planned Behaviour (TPB) model, serving as one of the three precursor constructs of behavioural intention (Ajzen, 1991). Kim and Hunter (1993) observed that most behavioural models establish a causal link from attitude, through intention, to actual behaviour, highlighting the need to comprehend behavioural intentions to forecast behaviour from attitudes. In particular, attitude refers to a person's favourable or unfavourable evaluation of a specific behaviour.

Besides, Belanche et al. (2022) used the TPB approach to confirm that users' attitude towards P2P payment applications in Spain is the primary determinant of their adoption of the service. The researchers found that

users' evaluations of the service are crucial in their decision-making process, influencing their use of the service and their willingness to recommend it to others. Lee (2012) also includes consumer attitude in his adoption model of service innovation, demonstrates that it has a major impact on how consumers absorb service innovation. This result is consistent with Kim and Hunter (1993) meta-analysis, which supports the strong attitude–intention–behaviour relationship and suggests that service providers should aim to change consumers' attitudes before promoting the adoption of service innovation. In a cross-sectional study of electronic banking adoption, Mohammad O. Al-Smadi (2012) found that attitude has a positive and significant influence on customers' intentions to use new technology.

Previous studies have found a connection between attitudes and intentions, as evidenced by studies conducted by Heijden (2003), Yang and Jolly (2009), and Yang (2012). While some authors, such as Davis et al. (1989) and Venkatesh and Davis (2000), have argued that attitude is not significant enough to be included in the model, however, attitude was included in the current model based on its successful role in explaining technology adoption in other domains (Ha & Stoel, 2009; Schierz et al., 2010; Yang, 2012).

In short, past studies have had varying results on the correlation between attitude and intention to use. Thus, this research paper assumes there is a significant correlation between attitude and Malaysian drivers' intentions toward RFID.

2.2.6 Social Media (SM)

Turban et al. (2015) defines social media as an online platform, allowing people to share their opinions, experiences, insights, and perceptions. According to Evans et al. (2009), social media is blooming nowadays which will directly affect the consumers' behaviour as numerous advertisements and promotions of the products or service will be shared over these

platforms. Some researchers have included the element of social media in determining the adoption of technology and innovative products.

The research of Bughin et al. (2010) discovered that advertisements on social media have a significant impact on consumers' purchase intentions. They noticed that the buyers always find the data of the product from social media for their analysis and comparison before purchasing it. Usually, they will prioritize the products that have good word of mouth by reviewing the feedback from others after use. Thus, the advertisements on social media may influence the Malaysians' intentions toward RFID since it is a new technology that has recently been used in several businesses.

Since the use of social media is increasing, electronic word of mouth (eWOM) conversations will have a significant effect on the customers' purchasing intentions (Erkan & Evans, 2016). This is because social media platforms allow opinion leaders to create and share information relating to the product and services. Additionally, social media platforms enable the widespread distribution of eWOM information globally. They found that the perceived usefulness, quality, credibility, usage, information requirements, and attitude towards information are the primary elements influencing consumers' purchase intentions. Hoyer et al. (2010) also found that the opinions and reviews given by others on social media will give a direct impact on the customers' purchase intentions as it helps to build trust in the customers which may influence their buying decisions.

Moreover, Hutter et al. (2013) conducted research that examined how user interactions on Facebook fan pages affecting customers' purchase intentions. They pointed out that social media activities can influence consumers' purchase decisions, as they may quickly switch products or brands if they see bad reviews or are annoyed by marketing efforts. In addition, Varghese and Argawal (2021) reported that social media influencers can have a positive impact on customers' purchase intentions. Their research showed that consumers are more attracted by the virtual element of advertisements

and products as there will have a lot of discounts and promotions which that can shift their perceptions and mindsets.

Furthermore, the past studies show that online advertisement may affect the consumers' purchase intentions which depends on some characteristics of online advertisement. Harshini (2015) found that the users of social media will be attracted by the advertisements that are shared on social media with some common features. For instance, they will purchase the products if the advertisements are informative, interactive, entertaining, and credible. Hence, marketing managers should consider the level of interaction, as well as the quality and quantity of information provided on their websites when designing online advertising campaigns (Harshini, 2015).

Conversely, some experts argued that the credibility and attractiveness of social media failed to influence the customers' purchase intentions (Lim et al., 2017). Due to the social media influencers' lack of expert knowledge about the endorsed products, it will cause an adverse effect on customers' purchase intentions. Till and Busler (1998) stated that the attractiveness of social media sources may not always lead to a strong purchase intention, as there is no guarantee that an attractive endorser will link to the purchase intention. However, the influencers are still important to the respondents' positive attitude. Thus, the marketer should choose suitable social media influencers who can affect the attitude and purchase intention of customers.

In short, past studies has demonstrated that the influence of social media has a varying result on the customers' behavioural intentions to use the products. Therefore, this research expects that there is a significant relationship between social media and Malaysian drivers' intentions to use RFID as an electronic payment in toll plazas.

2.2.7 Government Support (GS)

Government support is also referred to as government intervention. This research aims to explore the impact of government support on the intentions of Malaysian drivers toward RFID. The use of RFID for payment purposes is relatively new in Malaysia, and there are some issues associated with it, such as slower detection at toll booths compared to smart TAG and TNG prepaid card systems, weather-related inefficiencies, problems with partner e-wallet providers, and pricing disputes over RFID tags. Therefore, there is a divide in Malaysia regarding the adoption of RFID payment systems.

Consequently, experts recommend that the Malaysian government should intervene to tackle the problems associated with RFID technology. The CEO of the Federation of Malaysian Consumers Associations (FOMCA), Saravanan Thambirajah, emphasizes the importance of having multiple e-wallet service providers to give consumers options (Ragu, 2021). He notes that the governments need to resolve system glitches before convincing consumers to adopt RFID technology (Babulal, 2022). The comment suggests a correlation between government support and Malaysians' intentions toward RFID.

Previous studies have shown a significant relationship between government support and the adoption of new technologies. For example, government regulations can either facilitate or hinder innovation adoption (Tornatzky et al., 1990; Scupola, 2003). Lin and Ho (2009) also found that government involvement was critical to the uptake of RFID technology in China's logistics sector. Similarly, Ding et al. (2020) demonstrated that government intervention was significantly associated with the adoption of e-payments in Kuala Lumpur.

Conversely, some researchers have reported inconclusive results regarding the correlation between government support and Malaysians' intentions toward new technology. Wong et al. (2020) found insufficient evidence to support a significant relationship, while Jou et al. (2011) did not find empirical evidence to support a significant correlation between government attitude and the intention to use electronic toll collection (ETC) service.

In summary, past studies have had varying results on the correlation between government support and intention to use. Therefore, this research predicts that there is a significant relationship between government support and intention to use RFID.

2.3 Theoretical Framework

Perceived ease of use, perceived usefulness, social influence, attitude, social media, and government support are included as the independent variables whereas the intentions of Malaysian drivers toward RFID will be the dependent variable in this research. It is conceivable that these independent variables can effectively influence the dependent variable.

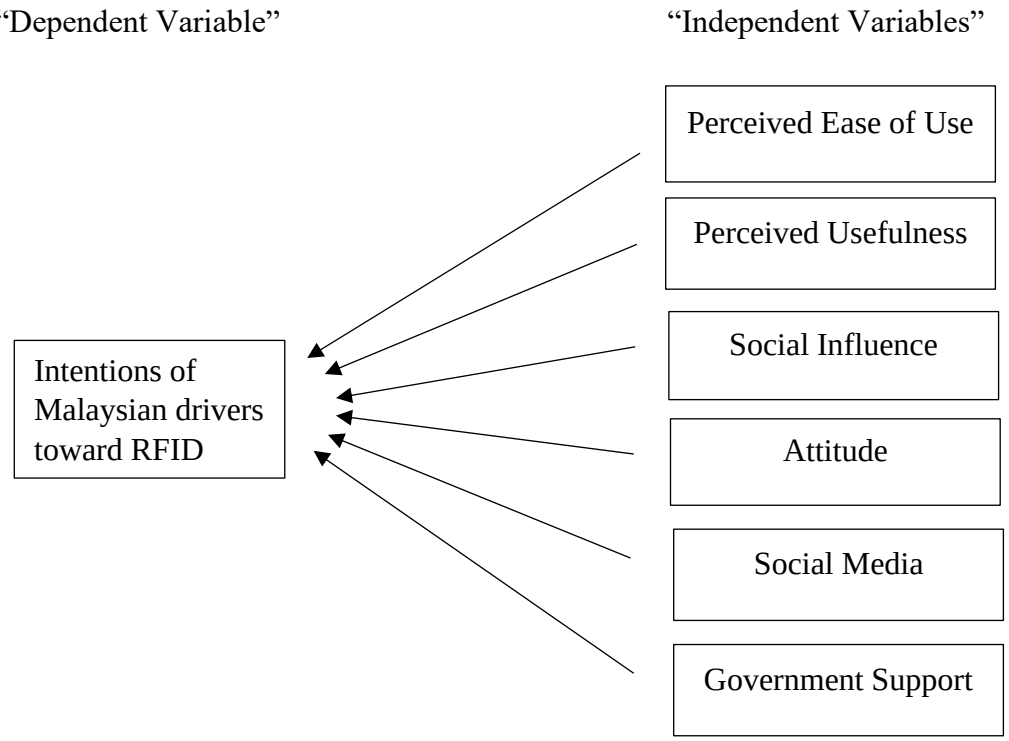


Figure 2.3. Proposed Research Framework.

2.4 Hypotheses Development

The following hypothesis testing was designed to investigate the research questions discussed in the earlier chapter.

H_0: Perceived ease of use has no significant relationship with Malaysian drivers' intentions toward RFID.
H_1: Perceived ease of use has a significant relationship with Malaysian drivers' intentions toward RFID.

H_0: Perceived usefulness has no significant relationship with Malaysian drivers' intentions toward RFID.
H_1: Perceived usefulness has a significant relationship with Malaysian drivers' intentions toward RFID.

H_0: Social influence has no significant relationship with Malaysian drivers' intentions toward RFID.
H_1: Social influence has a significant relationship with Malaysian drivers' intentions toward RFID.

H_0: Attitude has no significant relationship with Malaysian drivers' intentions toward RFID.
H_1: Attitude has a significant relationship with Malaysian drivers' intentions toward RFID.

H_0: Social media has no significant relationship with Malaysian drivers' intentions toward RFID.
H_1: Social media has a significant relationship with Malaysian drivers' intentions toward RFID.

H_0: Government support has no significant relationship with Malaysian drivers' intentions toward RFID.

H_1: Government support has a significant relationship with Malaysian drivers' intentions toward RFID.

2.5 Conclusion

Chapter two has discussed six independent variables including perceived ease of use, perceived usefulness, social influence, attitude, social media, and government support whereas the dependent variable is the intentions of Malaysian drivers toward RFID. The theoretical frameworks of the Theory of Planned Behaviour (TPB) and Technology Acceptance Model (TAM) were applied to explore the factors influencing Malaysian drivers' intentions toward RFID. The hypotheses were developed based on the theoretical framework discussed in this chapter.

CHAPTER 3: METHODOLOGY

3.0 Introduction

This chapter provides a comprehensive outline of the approach that will be used to conduct the research. It covers the research design, sampling techniques, data collection methods, research instruments, data processing, and data analysis. A more detailed explanation for each of these components will be provided later in this chapter.

3.1 Research Design

As stated by Sekaran and Bougie (1993), research design functions as a guide for collecting, measuring, and analysing data. It is a deliberate structure or framework developed to achieve the research objectives and address the research questions (Dulock, 1993). Research design includes the selection of research methods, data collection tools, research participants, and data analysis methods. In this research, descriptive research method was used.

3.1.1 Descriptive Research

Descriptive research is a research methodology that aims to describe and analyse a specific phenomenon, situation, or group. Its primary focus is on identifying and analysing the characteristics of a population, situation, or phenomenon without delving into the reasons for the behaviour but examining the "what" of the research subject (Bhat, 2022). Descriptive research does not involve manipulation or control of variables but rather focuses on collecting data and describing what has been observed. This type

of research can be conducted using a variety of methods such as surveys, interviews, observations, and existing data analysis.

In research by Bhat (2022), descriptive research can be defined as a quantitative research method that attempts to gather measurable data for statistical analysis of the population sample. This research uses descriptive research to analyse the trend in RFID adoption among Malaysian drivers. A demographic survey will be conducted to acquire information on the population and undertake descriptive research on this demographic segment. This survey will provide insight into "what is the factors affecting intentions of Malaysian drivers to use," without addressing any research data on the "why" of the trend (Dulock, 1993).

Besides, questionnaires are used to collect participant responses as part of the survey in this research. It enables the researchers to collect substantial amounts of data that can be examined for trends, averages, and frequencies. To be more precise, survey research enables the researchers to gauge how satisfied participants are with the RFID services used in this research. This survey technique is a well-liked way to gather feedback from respondents in market research. It is the preferred method for descriptive research since it can be done online as the sample size of 400 for this research is so large.

3.2 Data Collection Method

Data collection is the process of gathering data from various sources that allows the researchers to find the solutions for their specific problems and questions (Valcheva, 2021).

3.2.1 Primary Data

This research utilises primary data to effectively ascertain the intentions of Malaysian drivers in using RFID as an electronic payment method. Primary data is information that the researcher collects first-hand through various methods, such as surveys, interviews, experiments, or observations (Ajayi & Angura, 2017). Primary data is more reliable in this research because it comes directly from the targeted respondents. Additionally, the researchers have complete control over the data collection process, which can enhance the quality and accuracy of the data.

In this research, survey questionnaires were administered using Google Forms for data collection. Google Forms is an online form that enables the researchers to design and distribute a set of questions and options to the targeted population in various regions of Malaysia through a link. The link will be shared through social media platforms such as Facebook, WhatsApp, Instagram, Microsoft Teams, and others. The research aims to gather data from Malaysian drivers aged 17 years and above. This method enables the researchers to collect responses from individuals in different regions of Malaysia, making data collection more efficient and reducing the cost and time associated with traditional survey methods.

Furthermore, the data can be instantly transferred into the spreadsheet and analyzed using Smart PLS 4.0. Smart PLS is software created for variance-based structural equation modelling (SEM) using the partial least squares (PLS) path modelling method. The software provides users with the ability to define indicators for the variables and draw a path model between them.

3.3 Sampling Design

Sampling design refers to the approach used to select a representative group of individuals from a larger population, evaluate them in-depth, and draw conclusions that can be applied to the entire population without risk (Ilker Etikan et al., 2016).

Sample selection involves determining the appropriate sample size, sampling technique, sampling frame, and location.

3.3.1 Target Population

The targeted population for this research is Malaysian drivers who have used, still using or might use the RFID as a highway payment method. To be more specific, this research is focused on the population who are 17 years old and above, male and female that are located in Malaysia, and using electronic payment such as Touch 'n Go, SmartTag or RFID Tag for their highway payments. Malaysians were targeted as RFID technology is currently gaining greater recognition and is expected to develop further in Malaysia (Lim et al., 2019). Individuals who were at least 17 years old were chosen because that is the legal minimum age for obtaining a driver's licence in Malaysia.

3.3.2 Sampling Frame and Sampling Location

Sampling frame refers to the list of all possible elements or individuals in a population from which a sample can be selected (Turner, 2003). Sampling frame error may occur when certain sample elements are not listed or adequately represented in a sampling frame (Ruggles, 1995). In this research, the sampling frame would be the list of all Malaysian drivers who are 17 years old and above, as they are the targeted population for studying their intentions to use RFID as an electronic payment.

Soft copies of the questionnaires for this research will be distributed through an online tool which is known as "Google Form." The primary objective of utilizing this tool is to enable the swift and convenient collection of data from respondents, reduce the time needed for data collection, and allow for automated analysis of data using charts. The use of Google Forms also

makes it easier for researchers to send and receive the questionnaires, as they can be distributed online (Muhammad Iqbal et al., 2018).

Sampling location refers to the geographic area where the sample is selected from. It is important to define the sampling location because it can affect the representativeness and generalizability of the sample. In this research, the sampling location is Malaysia as the main focus is to study the intentions of Malaysian drivers toward RFID. Also, Malaysia is chosen because RFID technology has recently been developed and introduced in the country. By focusing on Malaysian drivers, the researchers can gain insight into the acceptance and adoption of this new technology in Malaysia.

3.3.3 Sampling Method

Taherdoost (2016) states that sampling techniques can be divided into two categories which are probability sampling and non-probability sampling. Purposive sampling from non-probability sampling is selected for this research because it is less expensive and simpler to implement. Purposive sampling, also known as judgement sampling, is a purposeful selection of the participants due to their qualities possess (Ilker Etikan et al., 2016). It is a non-random technique that does not require underlying theories or a predetermined number of participants. The participants for this research should be a driver, driving a car with the virtue of knowledge or experience in using electronic payment as a payment method on highways in Malaysia. Questionnaires in Google Forms will be distributed among Malaysians, but qualified participants will be screened after the questionnaires are received based on Section A of the demographic profile. Participants who do not have a valid driving license in Malaysia will be removed from this research. This action is being taken to fulfil the goals of the research as well as the purposive sampling.

3.3.4 Sampling Size

The Ministry of Economy Department of Statistics Malaysia (2022) calculated that the population of Malaysia in 2022 has reached 32.7 million, up from 32.6 million in 2021 with a growth rate of 0.2%. According to Krejcie and Morgan (1970), qualified research requires at least 384 questionnaires when the population is over 1,000,000 by referring to Appendix 3.1. Therefore, the sample size for this research is 400 as the population of Malaysia exceeding 1,000,000 to improve the accuracy of the research's findings. Before starting the actual research, a pilot test will be conducted with 30 respondents to assess and enhance the instrument and methodology (Shea & Bidjerano, 2018). The pilot test aims to identify and address any issues that may arise during the actual research process. This research aims to collect responses from more than 384 participants using an online questionnaire within the given time frame.

3.4 Research Instrument

The research instrument used in this research is a questionnaire, aimed at gathering and analyzing information on Malaysian drivers' intentions to use RFID as a highway payment method. A pilot test will be undertaken to improve the questionnaire's validity, reliability, and usability.

3.4.1 Questionnaire Design

The research tool selected for this research is a questionnaire, which is effective in measuring individual behaviour and can be distributed widely through email or social media ("How To Collect Quantitative Data", n.d.). Questionnaires are advantageous in that they can provide anonymous responses, leading to more reliable results without bias (Choudhury, n.d.).

Additionally, a structured questionnaire was utilized in this research, which presents predetermined alternatives and standardized questions.

The questionnaire in this research was divided into two parts. The first section was designed to collect demographic information, with seven questions related to gender, age, ethnicity, education level, monthly income, driving license ownership, and monthly frequency of highway usage. The second section of the questionnaire consisted of seven constructs, each containing several indicators to be assessed. These indicators include intention to use RFID, perceived ease of use, perceived usefulness, social influence, attitude, social media, and government support. Respondents were asked to rate their level of agreement with each indicator on a five-point Likert scale, where a score of 1 indicated strong disagreement and a score of 5 indicated strong agreement.

3.4.2 Pilot Test

Pilot test is a small-scale investigation that aids in the design of confirmatory research (Arnold et al., 2009). In this research, the pilot test aims to identify and resolve issues with the questionnaire to ensure the instrument's validity and consistency (Polit & Beck, 2017). According to Malhotra (2008), 30 to 100 responders are seen as a fair quantity for pilot testing. Hence, a sample of 30 targeted Malaysian respondents was selected for the pilot test. Also, Smart PLS 4.0 software will be used to analyse the information gathered from the respondents. The reliability of the research instrument will be measured using Cronbach's Alpha (CA), where a score of 0.70 or higher is considered acceptable. The validity of the research instrument will be determined using the Average Variance Extracted (AVE), where a score of 0.50 or higher is considered valid for this research. In short, the indicators in the questionnaire will be removed if CA is less than 0.70 and AVE is less than 0.50.

3.5 Construct Measurement

Questionnaires in this research are created based on one dependent variable and six independent variables which were intended to capture Malaysian drivers' intentions toward the adoption of RFID tags as a form of payment.

3.5.1 Scale of Measurement

Measurement scales refer to the definitions, classifications, and ways of conveying information through numerical values (Lee, 2016). The four common types of scales are nominal, ordinal, interval, and ratio scales, which were developed by psychologist Stanley Stevens (Borgatta & Bohrnstedt, 1980). The questionnaire in this research will use nominal, ordinal, and interval scales to measure the constructs.

3.5.1.1 Nominal scale

Nominal scale is a categorical scale that comprises two or more categorical groups, which assess a common underlying concept without any quantitative value (Cicchetti, 2014). The questionnaire in this research was developed based on a nominal scale and consisted of the following questions.

Gender □ Male □ Female
Ethnic □ Malay □ Chinese □ Indian □ Others
Driving License Ownership □ Yes □ No

3.5.1.2 Ordinal Scale

The second level of measurement, the ordinal scale, enables obvious hierarchical ranking or ordering of categories (Buchanan, 1974; Mishra et al., 2018). The questionnaire in this research was designed based on an ordinal scale and the following is a part of it.

Age

- □ 17- 26
- □ 27- 36
- □ 37- 46
- □ 47- 56
- □ 57 and above

Monthly Income

- □ RM 1,000 and below
- □ RM 1,001- RM 3,000
- □ RM 3,001- RM 5,000
- □ RM 5,001 and above

Monthly frequency of use of Malaysia's highways (eg: North-South Expressway)

- □ None
- □ 1- 5 times
- □ 6- 10 times
- □ 11- 15 times
- □ 16 times and above

3.5.1.3 Interval Scale

The interval scale is a type of quantitative measurement with the combination of nominal and ordinal scales ("Types of Data Measurement Scales", 2021). It is a numerical scale that specifies order and has equal intervals or distances between categories (Cicchetti, 2014). The Likert scale, which has equally spaced response options, falls under the interval scale category. For example, in a typical survey rating scale, a 5-point satisfaction

scale would be used, with options including strongly agree, agree, neutral, disagree and strongly disagree (("Types of Scale of Measurement", n.d.). Section B of the questionnaire will utilize a Likert scale for all questions. This questionnaire section was designed based on the interval or Likert scale.

Section B

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
I am willing to use RFID as a toll payment method.	1	2	3	4	5

3.6 Data Processing

Data processing is a crucial part for the researchers to carry out a preliminary screening of the questionnaire to ensure the data collected are accurate and able to meet the objectives of the research. This process consists of three stages, including questionnaire checking, data coding, and data transcribing. Meanwhile, the collected data will be analyzed using Smart PLS 4.0.

3.6.1 Questionnaire Checking

Questionnaire checking is an important step to ensure the questions in the survey are clear, unambiguous, and unbiased to obtain accurate results as the respondents' answers can easily be influenced by the question-wording. Thus, jargon or overly complex language should be avoided to increase the readability and clarity of the respondents. Moreover, the researchers should pay attention to the grammar of the questions to avoid misunderstandings by the respondents. Thus, all minor mistakes should be prevented because they may cause the collected data to become invalid and not reliable.

3.6.1.1 Data Checking

Data checking is necessary to ensure the accuracy and reliability of the collected data. After receiving the responses, the researchers will review the completed questionnaire to ensure that there is no missing data. Due to the result of analysis being affected by the review of respondents, data checking also involves the process of checking the criteria and quality of reviews of the target respondents to avoid the invalid or unreliable result.

3.6.2 Data Coding

Data coding will be applied in Section B of the questionnaire, where each respondent's answers will be represented by a numerical code. The Likert scale will be used in this section, with each response option assigned a code from 1 to 5, where 1 represents strongly disagree and 5 represents strongly agree.

Section B

I have intended to use RFID services.	Strongly disagree is coded as "1". Disagree is coded as "2". Neutral is coded as "3". Agree is coded as "4". Strongly disagree is coded as "5".

3.6.3 Data Transcription

Lastly, transcribing data is the final step in the data processing. It is a procedure for converting the data into statistical data. In this step, all the

coded data will be transcribed into PLS-SEM software to evaluate the significance of the variables.

3.7 Data Analysis

Data analysis is the practice of scrutinizing, manipulating, and interpreting data to generate significant findings that can assist in making informed decisions and drawing conclusions (Afiq Syawani et al., 2019). Partial Least Squares Structural Equation Modeling (PLS-SEM) is the analytical tool that used to explore the relationship between the dependent and independent variables.

3.7.1 Descriptive Analysis

Descriptive analysis is an approach to analysing data that simplifies data collected from a questionnaire by summarizing and illustrating it in an easily understandable way. It is often simplifying the data from the sample set into tables, charts, or graphs that represent the population. Descriptive analysis will be used to examine the demographic data of the participants based on questionnaire's Section A. This section will compile the demographic information used to characterise the sample of respondents in this research.

3.7.2 Review of Data Analysis

The validity evaluation is crucial in ensuring accuracy in measurement since relying solely on coefficient and significance may not always provide an accurate measure. Moreover, the measurement models should incorporate levels of awareness, validity, and reliability before testing the impact of independent variables on consumer behavioural intentions. Researchers frequently examine correlations between latent variables measured by observed variables to better understand consumer behaviour. For studying

these correlations, PLS-SEM has gained popularity. The approach remained popular in part due to the accessibility of Smart PLS, a feature-rich software package with an easy-to-use graphical user interface. Thus, the data that was obtained for this research is analysed using Smart PLS 4.0.

3.7.3 Evaluation of Outer Model

According to Siagian et al. (2022), the outer model analysis has to be carried out to evaluate and establish the relationships or influences of the variables addressed in the research before proceeding with the inner model analysis. The data must meet the following criteria to be deemed valid in this analysis, including a minimum factor loading of 0.50 for each item, an average variance explained (AVE) exceeding 0.50, a composite reliability (CR) exceeding 0.70, and a Fornell Larcker value exceeding the squared correlation with any other latent construct (Siagian et al., 2022). Additionally, the reflective outer model was measured based on internal consistency reliability, convergent validity, and discriminant validity.

3.7.4 Internal Consistency Reliability

Internal consistency reliability is a method utilised in research to determine the reliability of a test. Composite Reliability (CR) and Cronbach's Alpha (CA) are commonly used indicators to evaluate reliability by examining the relationship among observed item variables. In PLS-SEM, these measures are ordered according to the reliability of each specific indicator, with values ranging from 0 to 1. A higher value indicates a higher degree of reliability (Mohamad Rijal Abdul Hamid et al., 2017).

3.7.4.1 Composite Reliability (CR)

Composite reliability (CR), which is also referred to as construct reliability, is a statistical indicator that assesses the internal consistency of scale items and examines how they are related to one another. CR is somewhat similar to CA in that its value can range from 0 to 1. But compared to CA, CR makes it possible for the results to be less skewed because it considers the correlation error and standardised regression weights of each variable. According to Sharma (2016), CR value should ideally be at least 0.70. High CR is a good indicator that all items consistently measure the same construct.

3.7.4.2 Cronbach's Alpha (CA)

Cronbach's Alpha (CA) is a coefficient of internal consistency within research that first developed by Lee Cronbach in 1951. CA was originally designed to be one of several coefficients for evaluating consistency. It is commonly utilized to determine the reliability of psychometric tests among a specific group of individuals taking the test.

The majority of researchers who employ data evaluation have criticised CA for its limitations. The drawbacks of CA, include the assumption that all components are equally trustworthy or have equal main loadings on the construct. Second, it frequently underestimates internal consistency reliability when it is calculated. Thirdly, the number of elements on the scale has an impact on the CA value.

The CA coefficient considers both the sample size and the number of items and is used to gauge the internal consistency of research instruments when measuring various variables. To ensure adequate reliability in the research, the CA coefficient should be greater than 0.7 (Sharma, 2016).

Table 3.1

Rule of Thumb for Cronbach's Alpha

Cronbach's Alpha	Internal Consistency

$\alpha \geq 0.9$	Excellent
$0.9 > \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable
$0.7 > \alpha \geq 0.6$	Questionable
$0.6 > \alpha \geq 0.5$	Poor
$0.5 > \alpha$	Unacceptable

Note. From Sharma, B. (2016). A focus on reliability in developmental research through Cronbach's Alpha among medical, dental and paramedical professionals. *Asian Pacific Journal of Health Sciences, 3*(4), 271-278.

3.7.5 Construct Validity

The purpose of construct validity is to ensure that the results obtained from a sample accurately reflect the true score in the entire population (Singh, 2015). It evaluates how successfully the findings are drawn from the application of the hypotheses for which the test is intended. Campbell and Fiske proposed convergent and discriminant validity as a way to assess the construct validity of a test in 1959. The convergent validity was tested first in this research by looking at the corresponding outer and cross-loadings to identify any potential problems with specific items.

Hair et al. (2014) suggest that items can be remained if their outer loading exceeds 0.50. However, if an item has an outer loading below 0.5, it can be removed from the scale as long as doing so does not lower the AVE score. AVE should have a minimum value of 0.50, which indicates that the construct explains more than half of the variation in the indicators. Conversely, if the AVE is less than 0.50, there may be additional errors in the items that can lead to inaccurate analysis outcomes down the line.

3.7.5.1 Convergent Validity

Singh (2015) explains that convergent validity refers to the extent to which a scale item is similar to others and should theoretically correlate with them. The Fornell-Larcker criterion is frequently used to evaluate the degree of common variance between latent variables in a model. This criterion relies on several metrics, including the primary factor loadings, Average Variance Extracted (AVE) and Composite Reliability (CR). To meet the convergent validity criteria, the outer loading score should be no less than 0.70. Additionally, AVE assesses how much variance a concept captures compared to measurement error. A value exceeding 0.7 is regarded as very good, while a score of 0.5 is deemed acceptable. In comparison to CA, CR provides a more impartial evaluation of reliability, with a score of 0.7 or higher deemed acceptable (Hair et al., 2019).

3.7.5.2 Discriminant Validity

Discriminant validity is concerned with determining how distinct a particular construct is from other constructs and is used to establish whether the measurement is unrelated (Singh, 2015). Campbell and Fiske presented a validation method in 1959 based on the long-held belief that tests might be rendered invalid by excessive correlations with unrelated tests (Henseler et al., 2015). In general, the correlations between the measurements of possibly overlapped constructs were used to evaluate the discriminant validity. The principle of discriminant validity suggests that items from overlapping constructs should have stronger correlations with items from the same construct than with items from other constructs that are theoretically unrelated.

According to Fornell and Larcker (1981) and Singh (2015), the following requirements must be met for the discriminant validity test in the analysis to be valid: the level of the AVE square root must be greater than the other correlations among the latent variables; the cross-loadings on other constructs should be lower than the loadings of each indication on its construct; the HTMT ratio must not exceed 0.9. It will be further explored

how these indicators can be utilised to evaluate and analyse the issues with discriminant validity of the instruments-based structural equation model.

3.7.6 Evaluation of Inner Model

In this research, the relationships between the variables were explored using inner model analysis. To ascertain whether the hypotheses were accepted, the outcomes of this research will also be put into practice. In this research, a cut-off t-value of 1.96 was used. If the t-value between the variables was significantly below this cut-off value, null hypothesis was supported and result showed insignificant. Conversely, null hypothesis was rejected and result showed significant when the t-value between the variables was above 1.96 (Siagian et al., 2022).

3.8 Conclusion

In conclusion, the research method of this research had been explained clearly in this chapter. This chapter has outlined the research methodology, including the research design, sampling design, data collection methods, research instruments, data processing, and analysis. The results will be discussed in the next chapter.

CHAPTER 4: DATA ANALYSIS

4.0 Introduction

Chapter four of the research focuses on analysing and interpreting data collected from the questionnaire. The chapter includes demographic information about the participants and descriptive analysis. The research used Smart PLS 4.0 to explore the factors that affect the intentions of Malaysian drivers toward RFID.

4.1 Pilot Test Vs Real Test

Table 4.1

Cronbach's Alpha (CA) for Pilot Test and Real Test Comparisons

	Pilot Test	Real Test
Intention to Use (ITU)	0.962	0.941
Perceived Ease of Use (PEU)	0.904	0.901
Perceived Usefulness (PU)	0.888	0.881
Social Influence (SI)	0.862	0.855
Attitude (AT)	0.908	0.956
Social Media (SM)	0.907	0.890
Government Support (GS)	0.949	0.882

Table 4.1 compares the Cronbach's Alpha (CA) values of the pilot test and real test for the variables measured in the research. The results show that all constructs in both tests have good internal consistency, with CA values above the recommended value of 0.7. This suggests that the items in each construct are highly related and are measuring the same underlying concept. Though the CA values for some constructs in the real test are slightly lower than those of the pilot test, all values still exceed the recommended value, indicating that the constructs remain reliable.

Table 4.2

Composite Reliability (CR) for Pilot Test and Real Test Comparisons

	Pilot Test	Real Test
Intention to Use (ITU)	0.970	0.953
Perceived Ease of Use (PEU)	0.927	0.927
Perceived Usefulness (PU)	0.914	0.919
Social Influence (SI)	0.900	0.900
Attitude (AT)	0.929	0.965
Social Media (SM)	0.925	0.919
Government Support (GS)	0.959	0.909

The results of the Composite Reliability (CR) analysis for both the pilot test and the real test are presented in Table 4.2. The table indicates that most of the constructs had high CR values, implying good internal consistency. The similarity of values between the pilot test and real test suggests that the instrument used in the research has consistent reliability across different samples. Overall, the CR values for the real test are slightly lower than those of the pilot test, but still within an acceptable range.

Table 4.3

Average Variance Extracted (AVE) for Pilot Test and Real Test Comparisons

	Pilot Test	Real Test
Intention to Use (ITU)	0.841	0.771
Perceived Ease of Use (PEU)	0.680	0.716
Perceived Usefulness (PU)	0.607	0.741
Social Influence (SI)	0.645	0.693
Attitude (AT)	0.685	0.821
Social Media (SM)	0.677	0.695
Government Support (GS)	0.797	0.626

Table 4.3 shows the values of Average Variance Extracted (AVE) for the pilot test and real test comparisons. The recommended AVE value is 0.5 or above, which indicates good convergent validity. The table shows that all constructs in both the

pilot test and real test have good convergent validity, as their AVE values are above the recommended value. However, it can be seen that the values for the pilot test are slightly lower than those for the real test, which may be due to differences in sample size. Nonetheless, AVE above 0.5 indicate that the constructs are reliable.

4.2 Participation Rate

It is estimated that the total population in Malaysia will reach 32.7 million by 2022. According to the research of Krejcie and Morgan (1970), the authors recommended a minimum of 384 respondents when the population exceeds 1,000,000. Therefore, 411 questionnaires were collected, but only 400 were eligible for further analysis as the minimum requirement was that respondents must possess a valid driving license in Malaysia. Hence, 11 respondents were excluded from the research as they did not meet the criterion.

4.3 Descriptive Analysis

Descriptive analysis is a statistical method that is essential for summarizing and describing the data obtained from the questionnaire. Its main objective is to provide an accurate, concise, complete summary of the data by highlighting the significant characteristics of the sample respondents. Descriptive analysis is used to provide an overview of the demographic information relevant to the research, including age, gender, ethnicity, education level, monthly income, driving license ownership, and monthly frequency of using Malaysia's highways. To present the survey results in a clear and concise manner, a table and pie chart will be utilized.

4.3.1 Demographic Profile of Respondents

The demographic profile of each respondent is presented in Section A of the questionnaire. This research has successfully gathered 400 eligible participants in Malaysia.

4.3.1.1 Gender

Table 4.4

Gender

Gender	Number	Percentage (%)
Female	210	47.5
Male	190	52.5

Figure 4.1

Gender

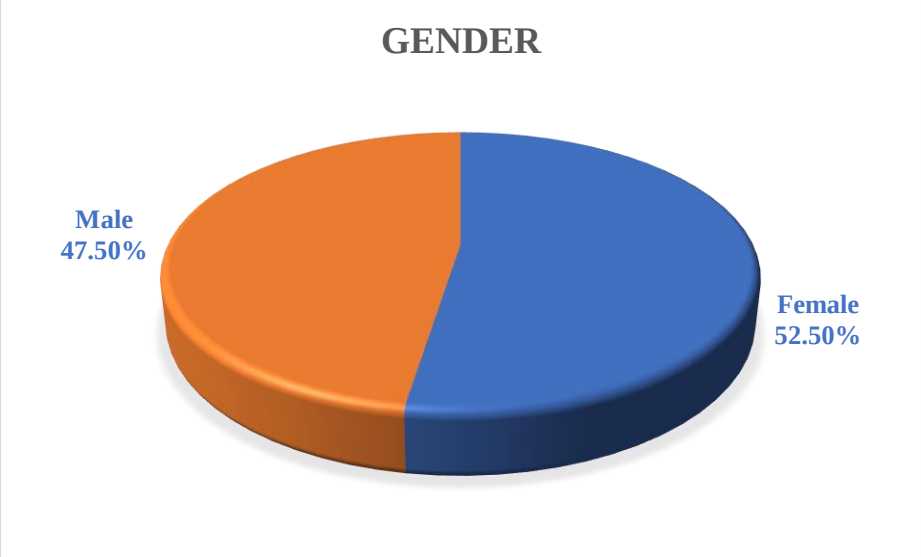


Figure 4.1 shows the gender distribution of the respondents in the survey. There was a total of 400 respondents, with 190 of them being male and 210 being female. This means that females make up a slightly higher percentage (47.5%) of the respondents compared to males (52.5%).

4.3.1.2 Age

Table 4.5

Age

Age	Number	Percentage (%)
17-26	174	43.50
27-36	93	23.25
37-46	69	17.25
47-56	43	10.75

Figure 4.2

Age

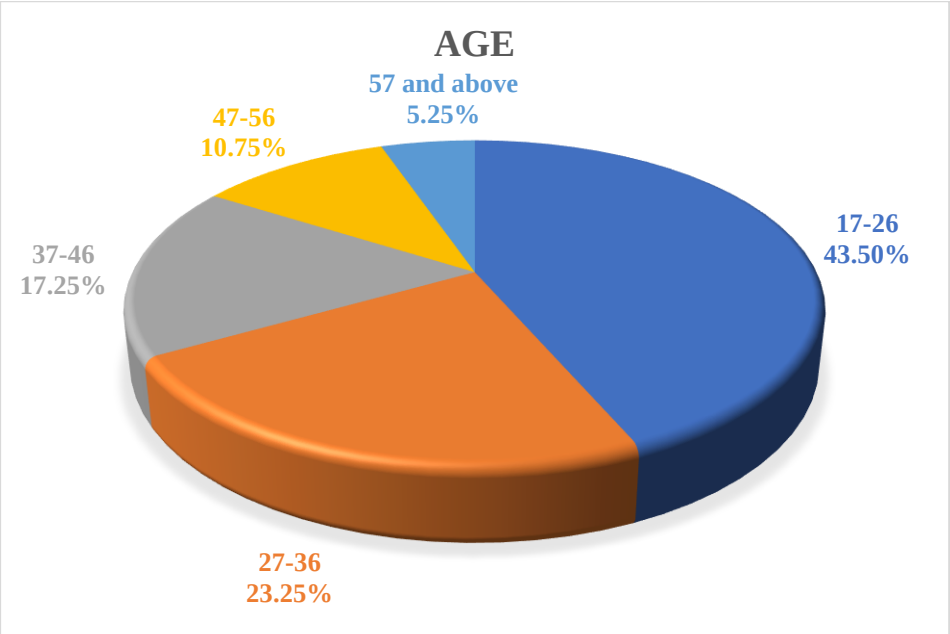


Figure 4.2 presents the distribution of respondents based on their age, where the age groups are categorized into four intervals. The first age group is 17-26, which represents 174 respondents or 43.5% of the total sample. The second age group is 27-36, which represents 93 respondents or 23.25% of the total sample. The third age group is 37-46, which represents 69 respondents or 17.25% of the total sample. The fourth age group is 47-56, which represents 43 respondents or 10.75% of the total sample.

4.3.1.3 Ethnic

Table 4.6

Ethnic

Ethic	Number	Percentage (%)
Chinese	253	63.25
Malays	87	21.75
Indians	60	15.00

Figure 4.3

Ethnic

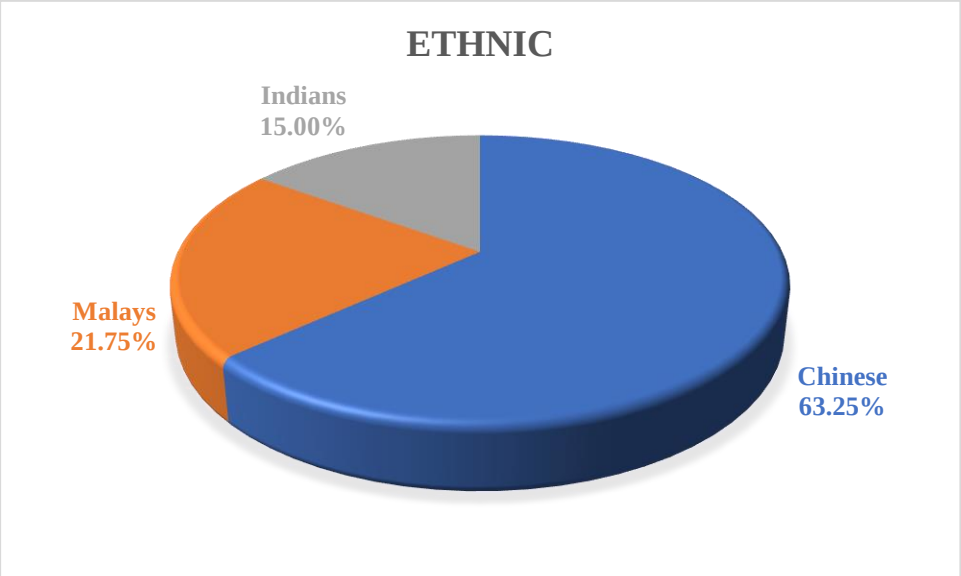


Figure 4.3 shows the ethnicity of the respondents. According to the pie chart, the greatest number of respondents are Chinese which has 253 people accounted for 63.25%. Following by second majority is Malay which has 87 people accounted for 21.75%. Lastly, the least number of respondents are Indian which has 60 people accounted for 15%.

4.3.1.4 Education Level

Table 4.7

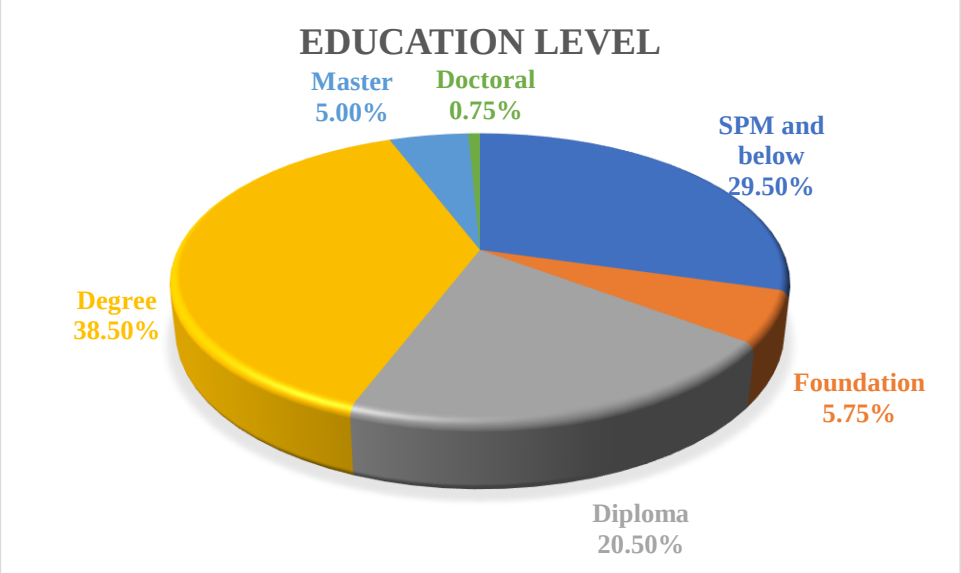
Education Level

Education Level	Number	Percentage (%)
SPM and below	118	29.5
Foundation	23	5.75

Diploma	82	20.5
Degree	154	38.5
Master	20	5
Doctoral	3	0.75

Figure 4.4

Education Level



According to Figure 4.4, the highest percentage of respondents, which accounts for 38.5%, attained a degree level of education. The second highest education level achieved by respondents was a diploma, with a percentage of 20.5%. Additionally, 29.5% of the total respondents obtained an education level of SPM and below. In contrast, the number of respondents who achieved a foundation or master level of education was relatively low, with only 23 and 20 respondents, respectively. Likewise, only 3 respondents (0.75%) attained a doctoral level of education. In summary, the majority of respondents attained a degree level of education, followed by those with a diploma or SPM and below level. Conversely, the percentage of respondents who attained foundation, master, or doctoral level of education was comparably lower.

4.3.1.5 Monthly Income

Table 4.8

Monthly Income

Monthly Income	Number	Percentage (%)
RM1,000 and below	122	30.50
RM1,001 – RM 3,000	87	21.75
RM3,001 – RM5,000	134	33.50
RM5,001 and above	57	14.25

Figure 4.5

Monthly Income

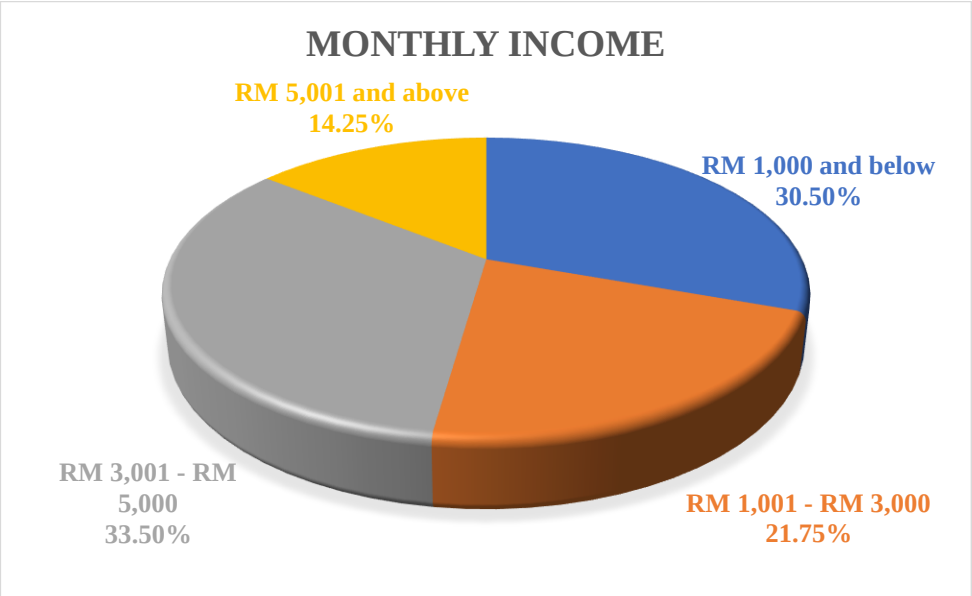


Figure 4.5 illustrates respondents' monthly income. The majority of respondents earned between RM3,001 to RM5,000 and RM1,000 and below per month, accounting for 33.5% and 30.5% of the total respondents respectively. Following this, 87 respondents (21.75%) reported having an income between RM1,001 to RM3,000. Lastly, 57 respondents (14.25%) reported having an income of RM5,001 or more. In short, more than half of the respondents collected an income of less than RM5,000.

4.3.1.6 Driving License Ownership

Table 4.9

Driving License Ownership

Driving License Ownership	Number	Percentage (%)
Yes	400	100
No	0	0

Figure 4.6

Driving License Ownership

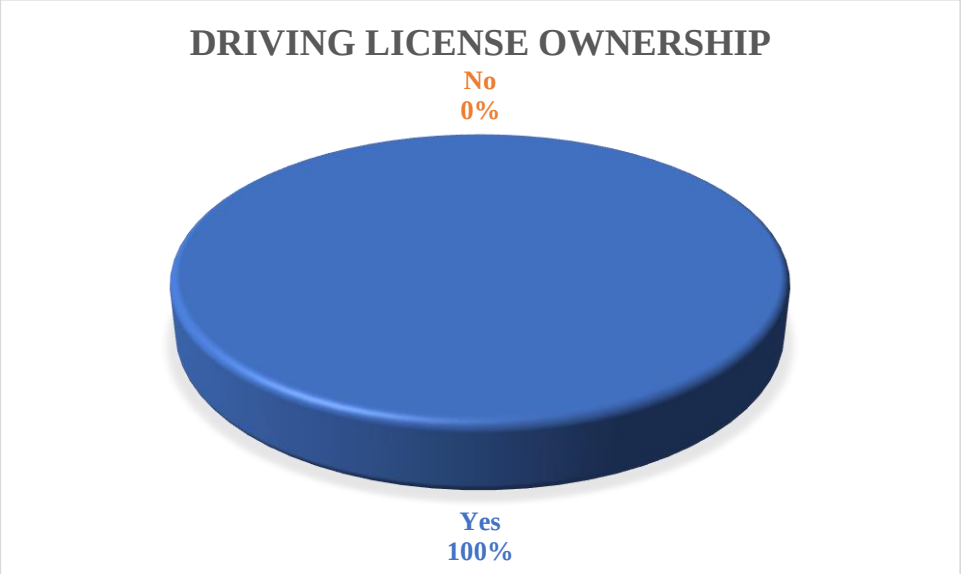


Figure 4.6 shows that all 400 respondents in the survey own a driving license as the research was conducted on a sample of individuals who are licensed to drive in Malaysia. This research obtained 411 questionnaires from respondents, but 11 participants were excluded from the study due to not having a driver's license.

4.3.1.7 Monthly Frequency of Use of Malaysia's Highways

Table 4.10

Monthly Frequency of Use of Malaysia's Highways

Monthly Frequency of Use of Malaysia's Highways	Number	Percentage (%)
None	51	12.75
1-5 times	157	39.25

6-10 times	100	25
11-15 times	44	11
16 times and above	48	12

Figure 4.7

Monthly Frequency of Use of Malaysia's Highways

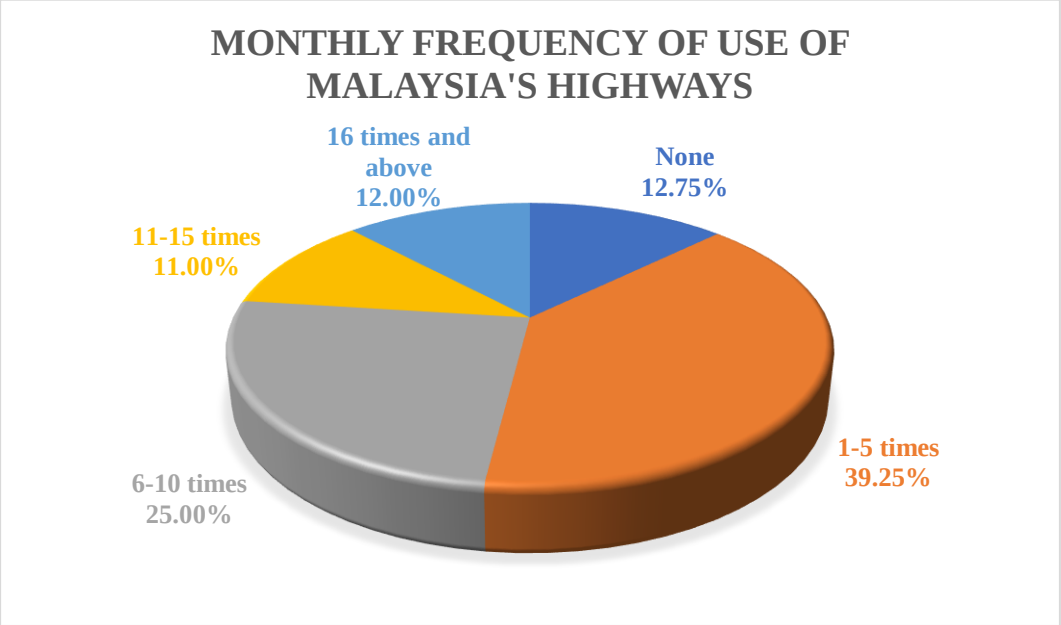


Figure 4.7 shows the frequency of respondents using Malaysian highway services within one month. According to the results obtained, the majority of respondents drive through the Malaysian highway 1 to 5 times a month, accounting for 39.25% of the 400 respondents. In addition, the number of respondents who use Malaysia highway zero times a month, 10 to 15 times a month and more than 16 times a month is not significantly different from 51 respondents (12.75%), 44 respondents (11%) and 48 respondents (12%). Last but not least, 100 respondents used the Malaysian highway 6 to 10 times a month (25%).

4.4 Measurement and Structural Model

In this research, the PLS-SEM approach will be utilized in this research, as it is a preferred method among many researchers when conducting research related to

social sciences. It enables them to analyze complex models and the relationships between variables (Nur Ainna Ramli et al., 2018). In the following section, the results obtained from the PLS-SEM will be thoroughly discussed and analyzed.

4.4.1 Internal Consistency Reliability

4.4.1.1 Cronbach's Alpha (CA), Composite Reliability (CR), Average Variance Extracted (AVE)

Table 4.11

Table of Cronbach's Alpha, Composite Reliability, Average Variance Extracted

	CA	CR	AVE
Intention to Use (ITU)	0.941	0.953	0.771
Perceived Ease of Use (PEU)	0.901	0.927	0.716
Perceived Usefulness (PU)	0.881	0.919	0.741
Social Influence (SI)	0.855	0.900	0.693
Attitude (AT)	0.956	0.965	0.821
Social Media (SM)	0.890	0.919	0.695
Government Support (GS)	0.882	0.909	0.626

Cronbach's Alpha (CA) is a significant measure to ensure the internal consistency and reliability of a sample group. Variables in table 4.11 are showing the acceptable value of alpha which are exceeding 0.7. ITU, PEU, and AT have higher CA values of 0.941, 0.901, and 0.956 respectively, indicating high reliability. However, the variables of PU, SI, SM and GS fall between 0.8 and 0.9 which are 0.881, 0.855, 0.890 and 0.882 individually. All variables are extremely trustworthy as the value are greater than 0.8.

Besides, Composite Reliability (CR) is another measure of internal consistency, which is more reliable than CA as it considers the measurement

of every variable's correlation error and standard regression weights. Table 4.11 shows that AT has the highest value of 0.965 across all variables. PU and SM have the same CR value which is 0.919. Additionally, the CR values for ITU, PEU, SI, and GS are 0.953, 0.927, 0.900, and 0.909 correspondingly. In short, all variables are considered as good and reliable indicators as their value are greater than 0.7.

Moreover, Average Variance Extracted (AVE) is used to evaluate convergent validity and measures the variance captured by a concept relative to the measurement error. A value of at least 0.5 is required for reliability. Table 4.11 shows AT has the highest AVE value at 0.821 among all the variables. Additionally, the AVE value for ITU, PEU, PU, SI, SM and GS are also considered acceptable because exceeding 0.5, which are 0.771, 0.716, 0.741, 0.693, 0.695 and 0.626 respectively. Thus, this suggests that all variables in the model are reliable.

4.4.2 Discriminant validity

Discriminant validity is a crucial research concept that ensures the distinctiveness of a construct from other similar constructs. It is important because when two constructs are closely related, it becomes difficult to discern which measure is accountable for an effect.

4.4.2.1 Fornell-Larcker Criterion

Table 4.12

Fornell-Larcker Criterion

	AT	GS	ITU	PEU	PU	SI	SM
AT	**0.906**						
GS	0.472	**0.791**					
ITU	0.859	0.442	**0.878**				

PEU	0.790	0.478	0.831	**0.846**			
PU	0.816	0.503	0.800	0.739	**0.861**		
SI	0.649	0.515	0.606	0.613	0.619	**0.833**	
SM	0.703	0.459	0.657	0.658	0.643	0.635	**0.834**

The Fornell-Larcker Criterion is a statistical technique utilized in SEM to assess the discriminant validity of constructs (Fornell & Cha, 1994). This method compares the correlation between constructs to the square root of the average variance extracted (AVE) of each construct (Hair et al., 2017). If the square root of AVE is greater than the correlation of the latent variable, the construct measures something unique, indicating satisfactory discriminant validity. The Fornell-Larcker Criterion was applied in Smart PLS 4.0, and Table 4.12 illustrates the results. The diagonal matrix represents the square root of AVE, the lower non-diagonal shows the correlation between the constructs, and the table indicates that all constructs have discriminant validity as the square root of AVE for each construct is higher than the correlation between constructs.

4.4.2.2 Heterotrait-Monotrait (HTMT) Ratio

Table 4.13

HTMT Ratio

	AT	GS	ITU	PEU	PU	SI	SM
AT							
GS	0.497						
ITU	**0.903**	0.460					
PEU	0.849	0.517	0.898				
PU	0.888	0.556	0.877	0.827			
SI	0.694	0.592	0.657	0.681	0.698		
SM	0.759	0.514	0.711	0.733	0.722	0.706	

The Heterotrait-Monotrait (HTMT) ratio is a reliable approach for assessing discriminant validity in structural equation modelling (SEM) that achieves higher sensitivity and specificity rates than other methods (Henseler et al., 2015). To pass this test, the HTMT ratio should be compared to a predetermined threshold. Some researchers have suggested that the acceptable threshold for this test should be 0.90 or below (Gold et al., 2001). Table 4.13 shows the HTMT ratio for each pair of latent variables, with all construct pairs having an HTMT ratio less than 0.90. The only exception is the ITU-AT construct pair, which has an HTMT ratio of 0.903. Overall, this indicates that all constructs have discriminant validity.

4.4.3 Factor Loadings

Table 4.14

Factor Loadings

	AT	GS	ITU	PEU	PU	SI	SM
AT1	0.879						
AT2	0.918						
AT3	0.906						
AT4	0.900						
AT5	0.913						
AT6	0.919						
GS1		0.822					
GS2		0.854					
GS3		0.700					
GS4		0.795					
GS5		0.777					
GS6		0.789					
ITU2			0.886				
ITU3			0.882				
ITU4			0.874				
ITU5			0.884				

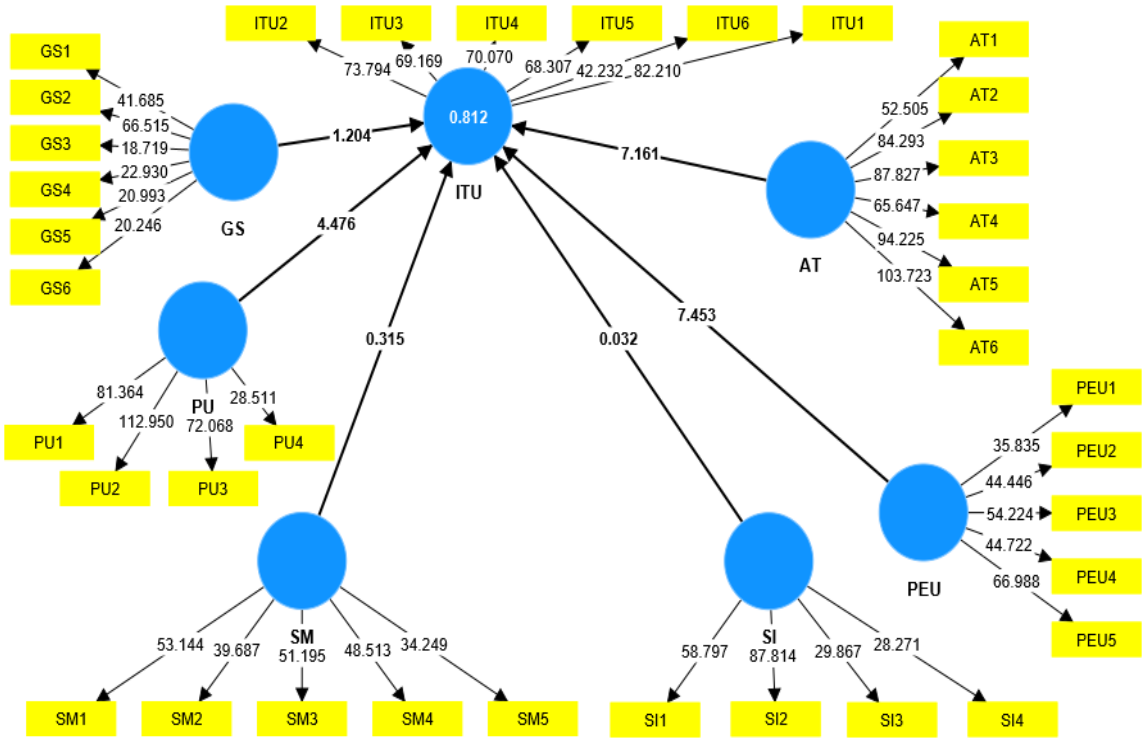
ITU6	0.838				
PEU1		0.810			
PEU2		0.847			
PEU3		0.862			
PEU4		0.842			
PEU5		0.869			
PU1			0.893		
PU2			0.914		
PU3			0.874		
PU4			0.754		
SI1				0.856	
SI2				0.878	
SI3				0.794	
SI4				0.799	
SM1					0.854
SM2					0.791
SM3					0.852
SM4					0.851
SM5					0.819
ITU1	0.903				

Factor loading is the construct validity test. It represents the strength of the relationship between an observed indicator and its underlying construct. Under the SEM model, a factor loading of 0.7 or above indicates that the factor removes enough variation from the variable (Hatcher, 1994). Table 4.14 shows all indicators are related to its underlying construct, as all factor loading are greater than 0.7.

4.4.4 Path Coefficient

Figure 4.8

Structural Model – Bootstrapping



Note: Designed for the research

Figure 4.8 shows inner model analysis for the relationship between six independent variables and one dependent variable. The t-values for attitude (AT), perceived ease of use (PEU), and perceived usefulness (PU) are all greater than 1.96, meaning that there is sufficient evidence to reject the null hypothesis of no relationship between these independent variables and intention to use (ITU). However, the t-values for government support (GS), social influence (SI), and social media (SM) are all less than 1.96, meaning there is not sufficient evidence to reject the null hypothesis of no relationship between these independent variables and ITU. Thus, the table suggests that there are significant relationships between ITU and AT, PEU, and PU, but not with GS, SI, and SM.

Table 4.15

Path Coefficient

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values	Result

AT -> ITU	0.415	0.417	0.058	7.161	0.000	Supported
GS -> ITU	-0.034	-0.033	0.028	1.204	0.229	Unsupported
PEU -> ITU	0.359	0.361	0.048	7.453	0.000	Supported
PU -> ITU	0.206	0.203	0.046	4.476	0.000	Supported
SI -> ITU	-0.001	-0.002	0.041	0.032	0.974	Unsupported
SM -> ITU	0.013	0.013	0.041	0.315	0.753	Unsupported

Source: Designed for the research
Note: Significant level is at 5%

The significance level, also referred to as alpha level, is the probability of rejecting the null hypothesis when it is true, in statistical hypothesis testing (Barnard, 1947). A significance level of 5% implies that the null hypothesis has a mere 5% likelihood of being rejected, even if it is true (Labovitz, 1970). To put it another way, if the statistical test's p-value is lower than 0.05, then the outcome is considered statistically significant at the 5% level.

Table 4.15 presents the path coefficient on Malaysian drivers' intentions to use RFID as an electronic payment. The results indicate a significant relationship between attitude (AT) and intention to use (ITU), with a p-value of 0.000. The result is supported by several research. Smith (2008), Chen et al., (2007) and Heras-Moline et al., (2017) evidenced a positive significant relationship between AT and intention to use ETC. Malhotra and Galletta (1999), as well as Nour-Mohammad Yaghoubi and Ebrahim Bahmani (2010) also showed a significant relationship between AT and behavioural intentions.

Similarly, for perceived ease of use (PEU) and perceived usefulness (PU), the path coefficients are 0.359 and 0.206, respectively, and both the p-values are less than 0.05, indicating that there is a significant relationship between these factors and ITU. Wang and Hwang (2011); Moore and Benbasat (1991); Yeow et al. (2017); Denaputri and Usman (2019) showed a positive

and significant relationship between PEU and individuals' intention to use e-payment in their research. According to various studies conducted by researchers including Chua et al. (2019), Sheng and Zolfagharian (2014), Rewah et al. (2022), Carranza (2021), and Md Shariff Hassan et al. (2022), it has been found that PU is strongly and positively associated with customers' intention to adopt new financial technology.

Conversely, for government support, social influence, and social media, the p-values are greater than 0.05, indicating that there is no significant relationship between these factors and intention to use. Firstly, Mohammad Alamgir Hossain and Mohammed Quaddus (2011) research supports that the lack of awareness of government regulations regarding RFID technology may contribute to the insignificant relationship found between government support (GS) and Malaysians' intentions to use RFID. Also, Jou et al. (2011) found that GS does not influence freeway drivers' intentions to use ETC services but is driven by individual convenience and personal factors.

Several researchers, including Davis (1985), Yeaman (1988) and Brown et al. (2010) have found an insignificant relationship between social influence (SI) and intention to use. Similarly, Lu et al. (2005) and Hsu and Lin (2008) have shown that SI is not significantly related to the intention to use new technologies. Tan et al. (2014) argues that users' decisions to adopt new technology are based purely on rational thought, rather than being influenced by social status or group think.

Lastly, previous research by Lim et al. (2017) and Erkan and Evans (2016) support an insignificant impact of source attractiveness in social media (SM) on consumer intention to purchase and use. Instead, it depends on how consumers perceive and react to social media electronic information. Bilal et al. (2014) noted that SM may have no effect on intention to adopt new technology. The research suggests that the impact of SM on consumer behaviour varies depending on factors such as the platform, technology, credibility, popularity, and cultural context.

4.5 Conclusion

In summary, data collected in the survey was analyzed using Smart PLS 4.0 to generate results. The research also created pie charts and bar charts to summarize the demographic data of the respondents. The validity and reliability of the variables were determined through data analysis using PLS-SEM.

CHAPTER 5: DISCUSSION, CONCLUSION AND IMPLICATIONS

5.0 Introduction

Chapter five primarily focuses on the statistical analysis and discussion of the significant discovery aimed at confirming the hypotheses proposed in the preceding chapter. After the analysis, this chapter discusses the implications, limitations, and recommendations for future researchers before concluding.

5.1 Discussions of Major Findings

Table 5.1

Summary of Statistical Analysis

Test	Research Question / Research Objective	Hypothesis	Hypothesis Decision	Results
Perceived Ease of Use	RQ: Is there any significant relationship between perceived ease of use and Malaysian drivers' intentions toward RFID? RO: To evaluate the relationship between perceived ease of use and Malaysian drivers' intentions toward RFID.	H_0: There is no significant relationship between perceived ease of use and Malaysian drivers' intentions toward RFID. H_1: There is a significant relationship between perceived ease of use and Malaysian drivers' intentions toward RFID.	Decision rule: Reject H_0 when p-value is smaller than 0.05. Otherwise, do not reject H_0. Decision making: H_0 is rejected because p-value is smaller than 0.05.	Significant (P-value = 0.000)

Perceived Usefulness	RQ: Is there any significant relationship between perceived usefulness and Malaysian drivers' intentions toward RFID? RO: To evaluate the relationship between perceived usefulness and Malaysian drivers' intentions toward RFID.	H_0: There is no significant relationship between perceived usefulness and Malaysian drivers' intentions toward RFID. H_1: There is a significant relationship between perceived usefulness and Malaysian drivers' intentions toward RFID.	Decision rule: Reject H_0 when p-value is smaller than 0.05. Otherwise, do not reject H_0. Decision making: H_0 is rejected because p-value is smaller than 0.05.	Significant (P-value = 0.000)
Social Influence	RQ: Is there any significant relationship between social influence and Malaysian drivers' intentions toward RFID? RO: To evaluate the relationship between social influence and Malaysian drivers' intentions toward RFID.	H_0: There is no significant relationship between social influence and Malaysian drivers' intentions toward RFID. H_1: There is a significant relationship between social influence and Malaysian drivers' intentions toward RFID.	Decision rule: Reject H_0 when p-value is smaller than 0.05. Otherwise, do not reject H_0. Decision making: H_0 is supported because p-value is larger than 0.05.	Insignificant (P-value = 0.974)
Attitude	RQ: Is there any significant relationship between attitude and Malaysian drivers' intentions toward RFID? RO: To evaluate the relationship between attitude and Malaysian	H_0: There is no significant relationship between attitude and Malaysian drivers' intentions toward RFID. H_1: There is a significant relationship	Decision rule: Reject H_0 when p-value is smaller than 0.05. Otherwise, do not reject H_0. Decision making: H_0 is rejected because p-value	Significant (P-value = 0.000)

	drivers' intentions toward RFID.	between attitude and Malaysian drivers' intentions toward RFID.	is smaller than 0.05.	
Social Media	RQ: Is there any significant relationship between social media and Malaysian drivers' intentions toward RFID? RO: To evaluate the relationship between social media and Malaysian drivers' intentions toward RFID.	H_0: There is no significant relationship between social media and Malaysian drivers' intentions toward RFID. H_1: There is a significant relationship between social media and Malaysian drivers' intentions toward RFID.	Decision rule: Reject H_0 when p-value is smaller than 0.05. Otherwise, do not reject H_0. Decision making: H_0 is supported because p-value is larger than 0.05.	Insignificant (P-value = 0.753)
Government Support	RQ: Is there any significant relationship between government support and Malaysian drivers' intentions toward RFID? RO: To evaluate the relationship between government support and Malaysian drivers' intentions toward RFID.	H_0: There is no significant relationship between government support and Malaysian drivers' intentions toward RFID. H_1: There is a significant relationship between government support and Malaysian drivers' intentions toward RFID.	Decision rule: Reject H_0 when p-value is smaller than 0.05. Otherwise, do not reject H_0. Decision making: H_0 is supported because p-value is larger than 0.05.	Insignificant (P-value = 0.229)

Source: Designed for the research

5.1.1 Perceived Ease of Use

Perceived ease of use refers to the degree to which a person believes a technology can be used without much difficulty. In this research, there was a positive and significant relationship between perceived ease of use and Malaysian drivers' intentions toward RFID. This finding is consistent with the theory of Technology Acceptance Model (TAM). This result also can be supported by Hasnah Abdul Kadir et al. (2022), Jou et al. (2011), and Nor Aslily Sarkam et al. (2021). In fact, RFID is relatively new in Malaysia and may be unfamiliar to some drivers especially elderly group who may be less tech-savy. The complexity of using RFID, including purchasing a tag, installing an e-wallet, linking the tag with the e-wallet, and topping up the balance, may deter some users. According to Suhaiza Zailani et. al. (2015), it stated that simplifying the process of using RFID can encourage more drivers to adopt it. In addition, clear and concise instructions or tutorials can make drivers feel more comfortable when using RFID (Irawan et al., 2016).

5.1.2 Perceived Usefulness

Perceived usefulness is the degree to which a person believes that a particular technology would enhance their productivity and effectiveness. In this research, perceived usefulness has been found positively and significantly related to Malaysian drivers' intentions toward RFID. This finding is supported by the theory and several previous research such as Hartini Azman et al. (2012); Chua et al. (2019); Tan et al. (2022); Gao and Bai (2014). Technology Acceptance Model (TAM) suggests that the perceived usefulness of a technology has a significant impact on an individual's intention to use it. As RFID is a completely new technology that used as toll payment, so the respondents may have high expectations for its performance and user experience (Syed Izmir Sabri, 2022). For instance, they may expect that the RFID system can function smoothly without any glitches or errors. Most of the respondents agree that they prefer to use the

electronic payment that can offer convenience (Tan et al., 2022). For example, the drivers can simply reload funds onto their accounts and make toll payments automatically without stopping and physically hand over cash. Therefore, it enables drivers to save time and reduce traffic congestion.

5.1.3 Social Influence

Social influence refers to the degree to which others in an individual's social environment influence them. In this research, social influence was found to have a positive but insignificant relationship with Malaysian drivers' intentions toward RFID. This result was similar to previous studies undertaken by Lu et al. (2005) and Tan et al. (2014). Venkatesh et al. (2003) stated that in forecasting intention to use a new technology, perceived ease of use and usefulness can exceed social influence. Tan et al. (2014) discovered that the users are not simply influenced by social status or group think and that their decision to adopt new technology is purely based on rational thought only. Additionally, the fact that the Malaysian government did not mandate the use of RFID and that there are alternative payment options available may have contributed to the insignificance of social influence in this context. Additionally, another possible explanation for this result is that new car purchasers may not need to place RFID tags as they are already incorporated in the vehicles by the manufacturer (Tao & Fan, 2017). For example, in the case of Perodua in Malaysia who places RFID stickers in the windscreen of new cars. In short, the intentions of Malaysian car drivers to use RFID tags is not solely due to social influences, but most likely due to some external factors that lead to their willingness to use them.

5.1.4 Attitude

According to the Theory of Planned Behavior (TPB), attitude as an individual's favourable or negative views towards the behaviour. In this

research, the result shows a positive significant relationship between attitude and Malaysian drivers' intentions toward RFID. Several previous studies also support the direct effect of attitude on the intention to use electronic toll collection systems (ETC) (Shaizatulaqma Kamalul Ariffin & Khor, 2020; Hartini Azman et al., 2012; Chen et al., 2007; Jou et al., 2011). Additionally, the researchers stated that the power of attitude is noteworthy as individuals confronted with new technology typically exhibit interest and are inclined to their adoption (Luna et al., 2017). Based on the survey in this research, the favourable attitude of Malaysian drivers towards RFID can be attributed to its novelty, ease, and compatibility with existing payment methods for toll collection. In short, the attitude of Malaysia drivers is a crucial determinant of their intentions to use RFID tags as a payment method, which is supported by the TPB theory. As a result, it is essential for governments and RFID operators to understand the drivers' attitudes toward RFID and develop strategies to promote positive attitudes towards this technology.

5.1.5 Social Media

Social media refers to digital platforms and tools that facilitate the creation, sharing, and exchange of content and opinions among consumers in virtual communities. In this research, the result demonstrates a positive but statistically insignificant relationship between social media and Malaysian drivers' intentions toward RFID. Social media may not directly impact Malaysians' intentions to use RFID, as it is a different technology from RFID. However, social media may indirectly affect Malaysians' attitudes and behaviours towards RFID adoption indirectly through various channels, including online reviews, word-of-mouth communication, and social media marketing. The research findings indicate that there is an insignificant relationship between social media and Malaysians' intentions toward RFID. This is because Malaysians do not consider social media as a credible source of information for promoting RFID adoption, even if the information is shared by popular influencers. This aligns with past research by Till and

Busler (1998), Lim et al. (2017), and Erkan and Evans (2016), which found that source attractiveness may not significantly impact consumer purchase and usage intention, and instead varies based on how consumers perceive and respond to electronic information from social media. Additionally, the research by Bilal et al. (2014) notes that some unpopular social media platforms have no effect on consumer purchase intention suggests that social media's influence may vary depending on the platform and context. Overall, the result indicates that the impact of social media on consumer behaviour can be influenced by a variety of factors, including the specific technology being advertised, the credibility and popularity of the social media platform, and the cultural and social circumstances of the intended audience.

5.1.6 Government Support

Government support refers to the initiatives and policies introduced by the Malaysian government to encourage the adoption and implementation of RFID technology in different industries. This can include financial incentives and regulatory frameworks aimed at promoting RFID usage and addressing any barriers to adoption. The result of this research shows that there exists a positive relationship between government support and Malaysian drivers' intentions toward RFID, but this relationship was found to be statistically insignificant, which aligns with the findings of prior research by Jou et al. (2011). Their research revealed that the government's support does not directly affect freeway drivers' attitudes and intentions to adopt ETC services. Freeway drivers have their own reasons for either accepting or rejecting ETC services, including factors such as convenience, regardless of the government's support. Additionally, the discovery of insignificant relationship between government support and Malaysians' intentions to use RFID is consistent with Muhammad Muazzem Hossain and Prybutok (2008) research, which stated that many freeway drivers were not aware of the government regulations regarding RFID technology. This lack of awareness may be a key factor contributing to the insignificant

relationship found in this research. Mohammed Alamgir Hossain and Mohammed Quaddus (2011) argue that respondents lack a thorough understanding of the regulations and their implementation, resulting in a minimal influence on their intentions. Therefore, it is essential to increase awareness and educate the public about the benefits and regulations related to RFID technology to encourage its adoption. In short, the intention of Malaysian drivers to use RFID tags is not affected by government support in this research.

5.2 Implications of the Research

In this research, only three independent variables show significant relationship towards Malaysian drivers' intentions to use RFID which are perceived usefulness, perceived ease of use, and attitude. This result has implications for various parties especially merchants and policymakers.

This result can be particularly useful for merchants, especially those who offer drive-thru services like restaurants. They may consider collaborating with Touch 'N Go Sdn Bhd (TNG) to launch RFID technology as a payment option for the drive-thru service. Since the result shows that perceived usefulness is an essential factor influencing drivers' intentions to use RFID, implementing the RFID technology in the drive-thru services would allow customers to make payments without the need to handle cash, sign receipts, or wait for change. Additionally, RFID technology can be applied to other area such as shopping complex parking systems. It has the potential to be utilized in the automated parking payment systems that allows drivers to enter and exit parking lots without stopping or paying at the booth. Nowadays, only Shell petrol stations collaborate with TNG company, however, this research proves that other petrol companies should consider collaborating with TNG company to launch an automatic fuel payment system, where the driver can simply make the payment by deducting the amount from TNG e-wallet through the scanned of RFID tag. This not only enhances the customers' satisfaction but also gains their loyalty.

Besides, the significant relationship found between attitude and the intention to use RFID implies that RFID technology providers should work closely with technical experts and professionals to make the technology more user-friendly, efficient, and convenient for users of all ages. For example, they can develop higher quality RFID tags or readers that are more resistant to interference. Regular maintenance and testing can also be conducted to address issues promptly and further improve the accuracy and reliability of the technology. By improving the performance of the RFID technology, drivers will have higher intention to use it.

To promote greater adoption of the RFID payment ecosystem in Malaysia, it is important to increase the accessibility and perceived usefulness of RFID payments. According to research, Malaysian drivers are more likely to use RFID tags for payment if they perceive them as useful. Currently, only RFID users can make toll payments through the TNG e-Wallet, which limits the accessibility of RFID payments and excludes users who prefer other e-wallets. However, e-wallet companies can collaborate to expand the number of available e-wallets that can be used for RFID payments, providing greater convenience and choice for the public. This will encourage more people to adopt RFID payments as a preferred payment method, leading to greater success of the RFID payment ecosystem. Furthermore, by expanding the number of available e-wallets, users will have a backup option if their preferred e-wallet experiences technical difficulties, promoting greater reliability and confidence in the system. Overall, collaboration between e-wallet companies can benefit both businesses and consumers by promoting greater accessibility, convenience, and reliability in the RFID payment ecosystem.

Lastly, the research finding shows there is an insignificant correlation between the government supports with the drivers' intentions toward RFID. The Malaysian government may not directly affect citizens to use RFID technology through regulations or incentives, but they can still influence their behaviour indirectly by improving the usefulness of RFID technology and thereby increasing drivers' willingness to adopt it. One way is to encourage collaboration between Malaysia's SMEs and TNG Company. For example, the government can incentivize interested businesses by offering benefits such as subsidies and tax exemptions. Additionally,

the government can represent citizens, providing feedback to relevant departments on both negative and positive user feedback to increase the effectiveness of RFID tags. Also, the government can increase the ease of use of RFID tags by offering a free installation service for each vehicle and mandate that RFID tags be installed by car manufacturers. Moreover, the government can consider removing toll barriers, similar to other countries like Singapore, and establish a legal framework to enforce fraud and bad toll payment situations. As technology continues to evolve, the RFID tag presents a prime opportunity to increase the ease of passing tolls in Malaysia.

5.3 Limitations of the Research

This research project has several limitations that need to be acknowledged to ensure the reliability and validity of the findings. The first limitation of this research is sample size bias, where the sample may not be representative of the entire population due to a certain group being overrepresented. For instance, a sizable proportion of the respondents (43.50%) were between the ages of 17 and 26. One possible reason for the higher representation of respondents aged 17 between 26 is the use of Google Forms as the data collection method, which is often used by younger generations who are more familiar with online technology. This may restrict the findings' generalizability to other age groups, since younger people may have different views and behaviours towards new technologies like RFID than older people. However, some researchers argue that this constraint is not as critical as potential and initial users of new technology are typically young and educated, and the population collected in this research falls into this group (Yang et al., 2012).

Secondly, the limitation of this research is that it does not include questions related to the respondents' state of residence. This limitation may restrict the analysis of potential regional differences in views and behaviours related to the research topic. For example, the absence of data on respondents' state of residence may have prevented addressing specific regional issues that may have emerged in the research. In other words, this research did not consider the possible differences in respondents' intentions to use RFID as a payment method across different states or

regions. This limitation may not affect the research finding, but it is important to acknowledge this limitation and consider modifying the data collection method in the future research to improve validity and comprehensiveness of its findings.

Moreover, the developed framework utilized in this research did not contain actual usage behaviour, meaning that the research did not explicitly measure whether or not people used RFID technology for toll payment. However, past studies have shown a significant correlation between intention and behaviour, implying that people's intentions to utilise a technology are typically a reliable predictor of their actual usage behaviour (Park & Jun, 2003; Venkatesh & Davis, 2000). As a result, the decision not to measure actual usage behaviour is deemed unimportant. In short, the findings of this research can still be useful in predicting future usage behaviour.

Lastly, the scarcity of previous research on the topic is a limitation of this research, making it impossible to develop a complete and accurate understanding of the problems. As a result, gathering relevant and reliable data has been problematic, as well as difficulties in interpreting and establishing the context of the findings. Hence, this research may have overlooked critical elements which could have been identified through previous research. In addition, a lack of relevant data may make it impossible to compare the current research's results to those of past research or to create a baseline for future investigations. Despite such limitations, this research fills the gap in the literature by providing a new perspective and contributing to the existing body of knowledge on the topic. For example, when searching for data and literature for this research, the terms 'new technology', ‘electronic payment’ and 'electronic toll collection system' are frequently used in place of RFID.

5.4 Recommendations for Future Researchers

There are several limitations being identified throughout the research process, and it is important to address them for future improvements. A significant limitation of this research is the overrepresentation of participants between the ages of 17 and 26, indicating sample size bias and a potential lack of generalizability to other age

groups. Future researchers should strive for a more balanced distribution of participants across different age ranges to achieve a more representative sample. This can be achieved by employing diverse data collection methods that allow for face-to-face interactions with potential participants. For example, face-to-face interviews can help reach individuals from different age groups and ensure a more diverse sample. Also, using a mix of data collection methods, such as online surveys and in-person interviews enables researchers to capture a wider range of views from participants with varying levels of technological literacy. Additionally, efforts can be made to specifically target underrepresented groups like older adults through collaborations with senior centres and retirement communities. Incentives such as vouchers or small gifts can be offered to participants as a token of appreciation for their time and effort, which may encourage participation from underrepresented groups. These strategies can help improve the diversity and representativeness of the sample and enhance the reliability and validity of the research findings.

Besides, future researchers should include questions that capture respondents' state of residence in the data collection process. This can be achieved by adding a demographic question in the survey or interview that asks respondents to indicate their state of residence. This approach can provide valuable insights into potential regional differences in perspectives, behaviours, and attitudes related to the research topic, particularly when studying topics that may exhibit cultural, economic, or social variations across different regions. For example, if the research topic involves studying consumer intentions toward a new technology, knowing the respondents' state of residence can help identify any regional patterns in preferences. It may reveal that certain states have distinct cultural or economic factors that influence consumer behaviour, such as varying preferences for new technology, different levels of accessibility toward new technologies, or unique consumer habits. This information can provide a more detailed understanding of the research findings and enable researchers to draw more accurate conclusions.

Moreover, future researchers could consider incorporating measures of actual usage behaviour in their research. This can provide a more comprehensive understanding of how people's intentions translate into actual behaviour as intentions do now always translate into their actual actions Additionally, researchers can explore any

disparities between intention and behaviour to identify potential barriers to technology adoption. They could also utilize various research methods, such as surveys, interviews, and observations, to better understand people's attitudes, perceptions, and behaviours toward RFID technology. By triangulating the findings from multiple methods, researchers can gain a more comprehensive understanding of the factors affecting the adoption and usage of RFID technology for toll payment.

Lastly, future researchers should note the limitation of the scarcity of past studies with the title of Malaysians' intentions to use RFID. However, related studies or studies conducted in other countries may have addressed similar research questions. Therefore, it is recommended that a comprehensive literature review be conducted to identify relevant studies, theories, and research gaps that can guide the research. Also, future researchers can investigate related areas or topics such as Malaysians' perceptions of new technology, cashless payment, or electronic toll collection system in Malaysia. This will provide a broader perspective on RFID technology adoption in Malaysia and help fill the gap in existing research.

5.5 Conclusion

This research has explored Malaysian drivers' intentions to use RFID tag as an electronic payment, with a focus on identifying the factors that affect adoption intentions. The research revealed that Malaysians' adoption intentions towards RFID technology are positively and significantly affected by their perception of its ease of use, usefulness, and attitude. However, the impact of social influence, social media, and government support on Malaysians' intentions to adopt RFID was found to be positive but statistically insignificant. This research is essential for future investigators who are looking to promote the adoption of RFID technology. In conclusion, this research has contributed to the understanding of the factors that affect Malaysians' intentions to use RFID technology and provides valuable insights for promoting its adoption in Malaysia.

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APPENDICES

Appendix 3.1

Table for Determining Sample Size of a Known Population

Note: N is Population Size; S is Sample Size

N	*S*	*N*	*S*	*N*	*S*
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	345
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	14	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364

120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Source: Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement*, *30*(3), 607–610.

Appendix 3.2

Survey Questionnaire Permission Letter

UNIVERSITI TUNKU ABDUL RAHMAN *DU012(A)*
Wholly owned by UTAR Education Foundation *(200201010564(578227-M))*
Faculty of Business and Finance
Jalan Universiti, Bandar Barat, 31900 Kampar, Perak
Phone: 05-468-8888
https://fbf.utar.edu.my/

23 August 2022

To Whom It May Concern

Dear Sir/Madam,

Permission to Conduct Survey

This is to confirm that the following students are currently pursuing their *Bachelor of Finance (Honours)* program at the Faculty of Business and Finance, Universiti Tunku Abdul Rahman (UTAR) Perak Campus.

I would be most grateful if you could assist them by allowing them to conduct their research at your institution. All information collected will be kept confidential and used only for academic purposes.

The students are as follows:

Name of Student	**Student ID**
Er Boon Xin	19ABB03004
Gan Jie Min	19ABB01298
Hing Yoke Shan	19ABB03849
Shen, Yu	20ABB04131

If you need further verification, please do not hesitate to contact me.

Thank you.

Yours sincerely,

Suki

.....

Dr Kuah Yoke Chin
Head of Department
Faculty of Business and Finance
Email: kuahyc@utar.edu.my

Administrative Address: Jalan Sg. Long, Bandar Sg. Long, Cheras, 43000 Kajang, Selangor D.E.
Tel: (603) 9086 0288 **Fax:** (603) 9019 8868 **Homepage: https://utar.edu.my/**

Appendix 3.3

Survey Questionnaire Sample with Supervisor Endorsement

Supervisor Endorsement:
Name: Dr Kuah Yoke Chin
Date: 22/8/2022
Sign: Suki

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UNIVERSITI TUNKU ABDUL RAHMAN

BACHELOR OF FINANCE (HONS)
FACULTY OF BUSINESS AND FINANCE
DEPARTMENT OF FINANCE

Final Year Project

Title of topic: A Study of Malaysian' Intention in Using RFID Tag as An Electronic Payment

Survey Questionnaire Sample

Dear respondents,

We are the final year undergraduate students who are currently pursuing Bachelor of Finance from Universiti Tunku Abdul Rahman (UTAR). We are currently conducting a survey which is entitled " A Study of Malaysian' Intention in Using RFID Tag as An Electronic Payment" for our final year project (FYP). This research aims to identify more about the Malaysian' intention to use RFID.

This questionnaire will take 5 to 15 minutes to complete. Your co-operation in answering this questionnaire is very much appreciated. This will be a tremendous help for the completion of our research and in the achievement of its purpose. We truly appreciate you for taking your time and effort in participating in this research. All of the information collected with regards to this research will be kept strictly private and confidential. All responses and findings will be used solely for academic research purposes. If you have any enquiry, please do not hesitate to contact any one of our team members.

Thank you very much for your time and participation.

Yours sincerely,

Name	Email	Phone Number
Er Boon Xin	boonxin22@gmail.com	010-9210109
Gan Jie Min	ganjiemin0511@gmail.com	017-7206482

Hing Yoke Shan	h.yokeshan@gmail.com	018-2127476
Shen Yu	shenyu6888@gmail.com	017-5249676

PERSONAL DATA PROTECTION STATEMENT

Please be informed that in accordance with Personal Data Protection Act 2010 ("PDPA") which came into force on 15 November 2013, Universiti Tunku Abdul Rahman ("UTAR") is hereby bound to make notice and require consent in relation to collection, recording, storage, usage and retention of personal information.

Acknowledgment of Notice

[ ] I have been notified by you and that I hereby understood, consented and agreed per UTAR above notice.

[ ] I disagree, my personal data will not be processed.

……
Date:

Section A: Demographic Profile

The following questions refer to the demographic profile to the respondents. Please provide the appropriate information by placing a (√) in the bracket provided to represent your answer.

1. Gender
   - Male
   - Female

2. Age
   - 17-26
   - 27-36
   - 37-46
   - 47-56
   - 57 and above

3. Ethnic
   - Malays
   - Chinese
   - Indians
   - Others:

4. Education Level
   - SPM and below
   - Foundation
   - Diploma
   - Degree
   - Master
   - Doctoral
   - Other, _____

5. Monthly Income
   - RM 1,000 and below
   - RM 1,001 - RM 3, 000
   - RM 3, 001 - RM 5,000
   - RM 5,001 and above

6. Vehicle ownership
   - Yes
   - No

7. Monthly frequency of use of Malaysia's highways? (eg: North- South Expressway)
   - None
   - 5 times
   - 6-10 times
   - 11- 15 times
   - 16 times and above

Section B

Please choose the best answer based on the scale of 1 to 5.

Note: Scale 1 indicates that you strongly disagree with the statement and 5 indicates you strongly agree with the statement.

Intention To Use

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.	I am willing to use RFID as a toll payment method.	1	2	3	4	5
2.	I will always try to use RFID in my daily life.	1	2	3	4	5
3.	I have intended to use RFID services.	1	2	3	4	5
4.	I will always be comfortable using RFID services.	1	2	3	4	5
5.	I have intended to increase my use of RFID technology in the future.	1	2	3	4	5
6.	I will use RFID more frequently with the future developments in RFID.	1	2	3	4	5

Perceived Ease of Use

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.	I think it is easy to use RFID as a toll payment method because it is able to	1	2	3	4	5

	deduct the balance directly from the Touch 'n Go e-wallet.					
2.	I find my interaction with the RFID clear and understandable.	1	2	3	4	5
3.	I think it is easy in learning how to use RFID.	1	2	3	4	5
4.	I will use RFID technology in paying tolls if the use of such technology is easier than that of the conventional methods.	1	2	3	4	5
5.	I will use RFID technology in shopping for groceries if the use of such technology is easier than that of the conventional methods.	1	2	3	4	5
6.	RFID technology enhances my paying experience.	1	2	3	4	5

Perceived Usefulness

		Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
1.	I can reach my destination more quickly with the use of	1	2	3	4	5

	RFID technology.					
2.	I will use RFID to save my time.	1	2	3	4	5
3.	I can enhance my effectiveness in the toll-paying process with the use of RFID technology.	1	2	3	4	5
4.	I will use RFID technology in shopping for groceries in future.	1	2	3	4	5
5.	I will use RFID technology in paying bills if the use of such technology in future saves my time.	1	2	3	4	5
6.	I will use RFID technology in paying tolls if it is more useful than that of the conventional methods. (i.e. SmartTag, Touch 'n Go)	1	2	3	4	5
7.	I will use RFID technology if it achieves my expectation.	1	2	3	4	5

Perceived Risk

		Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
1.	I think that RFID	1	2	3	4	5

	technology may create a risk.					
2.	I find it risky to retain my personal information confidentiality when using RFID technology.	1	2	3	4	5
3.	I think that the use of RFID technology might invade my personal privacy. (eg: tracking or monitoring driving)	1	2	3	4	5
4.	I would reject to use RFID technology if the third-party requests me to upload my personal information.	1	2	3	4	5
5.	I think that RFID has minimum financial risk.	1	2	3	4	5
6.	I think that RFID has minimum risk of fraud.	1	2	3	4	5

Social Influence

		Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
1.	People around me use RFID services for payment. (i.e.	1	2	3	4	5

	parent, family members, friends)					
2.	People who influence my behaviour think that I should use RFID.	1	2	3	4	5
3.	Recommendations from my family and friends on RFID influence me to use it.	1	2	3	4	5
4.	I would like to use RFID when my family and friends have benefited a lot from it.	1	2	3	4	5
5.	I feel more comfortable to use RFID when my parent, family members and friends are using.	1	2	3	4	5

Attitude

		Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
1.	I am very interested in RFID.	1	2	3	4	5
2.	I think RFID tag is good.	1	2	3	4	5
3.	I think that using RFID technology would be a good experience.	1	2	3	4	5
4.	I think that using RFID as a payment method is a good idea.	1	2	3	4	5

5.	I feel satisfied using RFID over conventional methods. (i.e. SmartTag, Touch 'n Go)	1	2	3	4	5
6.	I feel enjoyable when using RFID as a payment method.	1	2	3	4	5

Social Media

		Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
1.	I could find information of the RFID on social media.	1	2	3	4	5
2.	I could receive information of RFID on social media.	1	2	3	4	5
3.	I could receive the user experience feedback of RFID on social media.	1	2	3	4	5
4.	I think that the information of RFID shared by social media is useful.	1	2	3	4	5
5.	I think the information of RFID that I received via social media is acceptable.	1	2	3	4	5

6.	I think the advertisement of RFID on social media is persuasive.	1	2	3	4	5

Government Support

		Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
1.	Reduction in the price of RFID tag will increase my intention to use RFID as a payment method.	1	2	3	4	5
2.	It will increase my intention to use RFID if the government provides more benefits for it.	1	2	3	4	5
3.	The government's promotion of RFID technology for the toll collection is proactive.	1	2	3	4	5
4.	The government should create an agency to protect Malaysian from privacy invasions that may result from the use of RFID.	1	2	3	4	5

5.	I support laws that will confer individuals with the right to know what information is gathered about them using RFID technology.	1	2	3	4	5
6.	Government support is significant in adopting RFID technology.	1	2	3	4	5