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**Exploring the Impact of Perceived Risk on Consumers' Willingness
to Use Instant Messaging Software LINE – Telecommunication
Frauds Experience as a Moderator**

探討知覺風險對消費者使用即時通訊軟體 LINE 意願之影響 –
以電信詐欺經驗為干擾變數

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Exploring the Impact of Perceived Risk on Consumers'
Willingness to Use Instant Messaging Software LINE -
Telecommunication Frauds Experience as a Moderator

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摘要

隨著電信科技和通訊設備的進步，加上 4G 吃到飽資費的盛行，民眾的生活也間接有了劇烈的變化。以智慧型手機上的即時通訊軟體 LINE 為例，在台灣，年齡介於 12-65 歲的台灣民眾中，有將近 91% 的人口，高達 1,700 萬人都在使用即時通訊軟體 LINE。但也因為即時通訊軟體的便利，加上網路世界虛實難辨的特性，提供了電信詐欺犯罪者有更多的管道及手段來進行詐欺。

而在經濟學上，幾近零邊際成本的現象，也已經在電信通訊產業造成極大的壓力。詐騙集團可藉由邊際成本趨近於 0 的特性，來大幅降低犯罪成本。所以，可以預期未來將會有更多電信詐欺案件的發生，而智慧型手機上的即時通訊軟體 App，就是一個很容易被用來進行攻擊的管道。

本研究將針對使用者對於即時通訊軟體 LINE 的知覺風險作深入探討，並且加入電信詐欺經驗做為干擾變數，來觀察使用者是否會因為有了電信詐欺的經驗，而在使用即時通訊軟體 LINE 的使用意願上會產生其他負面的相關影響。

本研究結果顯示，消費者的心理風險對於使用即時通訊軟體 LINE 之知覺風險會有正向且非常顯著的影響。也就是說過度的垃圾訊息或廣告，確實會提升消費者對於使用即時通訊軟體 LINE 感到厭煩，以及隱私洩漏的疑慮。另外，本研究結果也顯示，消費者的電信詐欺經驗對於使用即時通訊軟體 LINE 之使用意願會有負向且非常顯著的影響，具有干擾作用。也就是說消費者如果在即時通訊軟體 LINE 上接收了過多的詐騙訊息，又或者有過實際上被詐騙而造成損失的經驗，都會影響到消費者對於即時通訊軟體 LINE 的使用意願。

關鍵字:知覺風險、即時通訊軟體、LINE、電信詐欺經驗、使用意願、干擾變數

Abstract

With the advancement of telecommunications technology and “unlimited 4G data plan” have reshaped contemporary life style and behavior drastically. Taking the instant messaging software LINE on a smart phone for example, according to a survey released by Nielsen in 2016, nearly 91% of Taiwanese people aged 12-65, and about 17 million people are frequent users of LINE. However, due to the convenience of telecommunications technology and the unpredictability of the Internet world, it also provides more new channels and means for fraudulent activities.

In economics, the phenomenon of near-zero marginal cost has also caused great pressure in the telecommunications industry. Fraudulent criminal group can significantly reduce their telecommunication costs by marginal cost approaching zero.

Therefore, it can be expected that there are going to be more cases of telecommunications frauds in the future. The instant messaging App on the smart phone is a channel that is easily used by criminals to carry out malicious attacks. For the reason, consumers' perception of the risk of instant messaging software App is one of the topics that must be studied in depth.

This study focuses on the user's perceived risk of instant messaging software LINE, and chooses the telecommunication frauds experience as a moderator to observe whether users reduce use instant messaging software LINE's willingness because of the experience of telecommunication frauds. This study can assist social network service providers to pay attention to the types of risks when updating or developing their services, and design a better user experience process to increase the

consumer's willingness to use.

The results of this study indicate that consumers' psychological risks, which cause a positive and very significant impacts on perceived risk of using LINE. In other words, spam or advertisements on the instant messaging software LINE can annoy consumers and cause consumers to doubt about privacy leakages.

In addition, the results of this study indicate that consumers' telecommunication frauds experience has a negative and very significant impact on the willingness to use LINE, with interference effects. In other words, if consumers receive too many frauds on LINE, or have experienced losses caused by fraud, it will affect consumers' willingness to use LINE.

Key words: perceived risk, instant messaging software, LINE, telecommunication frauds experience, willingness to use, moderator

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Chapter 1 Introduction

The innovation brought by instant messaging software, further accelerating the transmission of information in people's lives, and creates an inseparable relationship between people's lives and mobile devices. Therefore, this study aims to explore the extent to which consumers are aware of the perceived risk of instant messaging software LINE after having telecommunication frauds experience, and what kind of effect will it cause on the willingness to use the instant messaging software LINE?

For that reason, this chapter focuses on explaining the concepts and research motivations of this study, and then proposes research purposes. Finally, the process and method of the whole research are described by the research flow chart. The section 1.1 explains the background, and the section 1.2 explains motivations of this study, and the section 1.3 describe the main issues to be explored, and the section 1.4 depicts the research process.

1.1 Research Background

In recent years, the global telecommunications industry has flourished, and most of the main factors are affected by the policy of telecommunications liberalization. Therefore, all countries have been actively investing considerable resources and infrastructure to promote the development of the telecommunications industry and have a huge impact on the global telecommunications market. The main purpose of Taiwan's telecommunication liberalization is to eliminate unnecessary supervision based on the principle of fairness and justice.

Through the free market competition mechanism, the government creates a good environment for the development of Taiwan's telecommunication industry, and encourages telecommunication operators to invest in the development of telecommunication technology and services. Through effective improvement of operational efficiency and quality of telecommunications services, the ultimate goal is to enable consumers to enjoy diversified and affordable telecommunications services with high quality.

According to the "2016 Taiwan Wireless Network Usage Survey" surveyed by the Taiwan Network Information Center (TWNIC) in November 2016, the report pointed out that the Taiwanese people's mobile Internet access rate from 79.8% in 2015 grew to 91.3% in 2016. The popularity and growth of the Internet has greatly changed the behavior of people using mobile communications. The mobile Internet usage rate has increased year by year, and the competition in the telecommunication market has become more intensified (Taiwan wireless network usage survey · 2016).

But with the rapid development of global communication technology, the high popularity of smart devices, the rapid development of social networking sites and free instant messaging software, and the constant innovation of APP-related applications on smart phones have also given gangsters a chance with multi-channel. Internet have cross-border and hidden features to engage in criminal behavior. (Police Annual Report · 2014).

In addition, according to the statistics of the Ministry of Justice, from 2011 to October 2016, a total of 49,000 people in Taiwan were prosecuted for telecommunications fraud cases, and 34,000 were sentenced, but 29,000 of people were only sentenced to less than 6 months, and only 8 people have been sentenced to prison for more than 5 years. So, it can be clearly found that the ratio of telecom fraud cases in Taiwan accounting for the total number of fraud cases is significant, the proportion of telecommunications fraud that is actually made a major penalty is too low, resulting in no sufficient deterrent effect.

Due to the convenience of telecommunications technology and the unpredictability of the Internet world, it also provides more channels and means for criminal activities and cause the criminal patterns more diversified and internationalized indirectly. Taking the instant messaging software LINE on a smart phone as an example, whether the public has sufficient knowledge to judge whether the coming messages embedded with harmful illegal intentions is an issue.

The instant messaging software LINE is an App that is very popular among Taiwanese users, no matter Android or iOS platform. According to the Institute of Innovation Application Services, it is shown in the survey analysis of the use behavior of Taiwan social websites published in 2017. In the instant messaging software category, LINE ranks the first in terms of market share, with a population of up to 87.1% of the country's population, LINE strives to develop convenient and caring services in order to meet various needs of consumers, such as business, mobile payments, mobile games, official fans accounts, and more.

However, because LINE has the highest market share, it has become a common

defraud tool for criminal groups and uses LINE's convenient features to spread fraudulent emails with virus links. Once users accidentally click on links, these malicious programs may cause the exposure of consumers' personal privacy information and credit card shopping records, which indirectly leads to various telecommunication fraud cases.

1.2 Research Motivation

Therefore, it can be expected that there are going to be more cases of telecommunications fraud in the future, and spread through the emerging telecommunications technology, and the instant messaging App on the smart phone is a channel that is easily used by criminals to carry out malicious attacks. For the reason, consumers' perception of the risk of instant messaging software App is one of the topics that must be studied in depth.

Consequently, this study uses the perceived risk commonly found in psychology research to analyze risk dimensions that impact consumers' willingness to use. Peter & Tarpey (1975) constructed the six perceived risk dimensions that is used the five risk dimensions of Jacoby & Kaplan (1972) plus the time risk dimension of Roselius (1971). It is the most widely used on psychology research; Brooker (1984) also believes that perceived risk should include six dimensions in order to more accurately measure consumer perceived risk; Tan (1999) also uses these six dimensions to measure the consumer perceived risk of online shopping. According to the research topic, this study will also measure the perceived risk with six dimensions. The six dimensions include: Financial risk, Performance risk, Physical risk, Psychological risk, Social risk and Time risk.

Finally, this study focuses on the user's perceived risk of instant messaging software LINE, and choose the telecommunication frauds experience as a moderator to observe whether users reduce use instant messaging software LINE's willingness because of the experience of telecommunication frauds.

1.3 Research Question

From the above research background and motivation, we can learn that the rampancy of telecommunication fraud has already had a great impact on the lives of the people and also caused a heavy burden on society. In particular, the rapid development of communication technology and the innovation of fraudulent techniques have not only increased the difficulty of law enforcement and crime resolution, but also made the public unable to prevent it.

With the popularity of smart phones, mobile instant messaging MIM (Mobile Instant Messaging) has gradually replaced the traditional newsletter by traditional telecommunication companies. It also gradually replaced call services provided by traditional telecommunication companies, and had become the new communication link between friends and relatives. Taking instant messaging software LINE as an example, LINE is the most instant messaging software in Taiwan, it provides free messaging and calling functions. LINE gradually extends services in multiple areas, it also provides users with application services beyond communication.

Therefore, this study adopts use the experience of instant messaging software LINE as an example to explore the consumer's risk perceived behavior when using

instant messaging software, which enables help the government to better understand what the people are confronting and what kind of help is necessary. It can also assist manufacturers pay attention to the types of risks when updating or developing other services, design a better user experience process, increase the willingness to install and pay for in-app purchases.

Therefore, the main purposes and problems of this study can be summarized into the following two points:

1. Do consumers perceived risk affect on the willingness to use LINE?
2. Can a moderator of the telecommunication fraud experience cause some modulating effect on consumers' willingness to use LINE?

1.4 Research Flow

This study is divided into five chapters. Figure 1.1 is the flow chart of this study. The chapters are explained as follows. The first chapter is the introduction, which explains the background and motivation of the research, and then establishes the research purpose. The second chapter is literature review. It collects and collates the previous related literatures in order, and infers the research structure and hypothesis of this research according from the literature. The third chapter is the research method, which explains the experiments and processes designed according to the research structure and assumptions, and the subsequent data analysis methods. The fourth chapter analyzes the data collected by the experiment to verify the previously raised questions. Finally, the fifth chapter summarizes and gives recommendations to the study based on the results of the analysis.

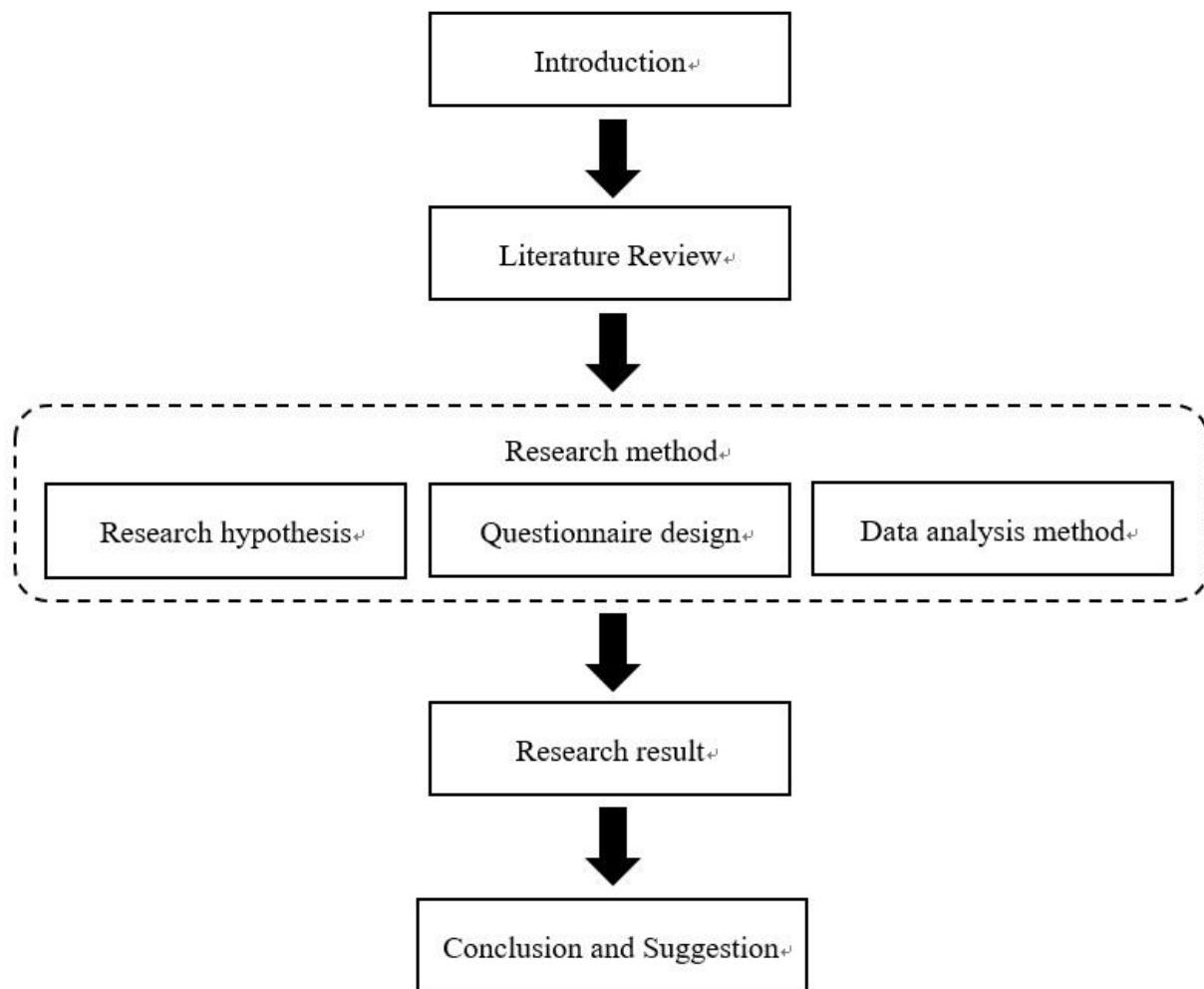


Figure 1.1 Research flow chart

Chapter 2 Literature Review

Before conducting the research of this thesis, the relevant literature will be discussed and organized into the following four chapters. The first section introduces the current situation of Taiwan Telecom fraud crimes and classifies them by the content of crime data; the second section introduces the instant messaging software LINE from the perspective of security, and focuses on data collection in various reports and fraud cases; the third section is to explain the theory of perceived risk in psychology, including the relevant application scope of the theory; the fourth section is a literature definition of the willingness to use.

2.1 Current Situation and Features of Taiwan Telecom Fraud Crime

The problem of fraud in Taiwan has been an important issue in the society, it plagues government and the people in recent years. The problem of fraud in Taiwan has been an important issue in the society that has been plagued by the government and the people in recent years. Especially in the 21st century network and communication developed generations, the fraudulent methods of fraud groups have also evolved, using technology fraud traps. Criminal methods are similar to the virus of the Internet, through the power of the Internet or communication technology, fraud cases emerge in an endless stream. Even many intellectuals, white-collar workers, and even university professors are deceived. From the media reports, the case of people being deceived can be seen almost every day. Obviously, the type of this criminal has the trend of rapid increase (Wu Feng Journal, 2012).

As defined in Table 2.1, “telecommunication frauds” is a type of fraud that is traditionally used. This type of crime involves the use of high technology and evolves with the rapid advancement of technology. Therefore, telecommunication frauds is a new type of crime method of communication and information technology to commit crimes.

Table 2.1 The differences between traditional frauds and telecommunication frauds

Type	Definition
Traditional frauds	The traditional fraud crime is the crime of fraud under Article 339 of the Criminal Law: "It means that the suspect has obtained the illegal interests of the victim's property by means of illegal means or fraud."
Telecommunication frauds	Telecommunications fraud refers to the use of telecommunications technology to construct telephones, the Internet and other information dissemination channels, randomly distributing false information to the public, thereby defrauding private property, so telecommunications fraud is a variant of traditional fraud crime in the Internet age; unlike traditional fraud, where suspects need to be in positive contact with victims, telecom fraud is a long-range, non-contact crime. If the suspect does not need to be in positive contact with the victim, he can commit fraud and obtain financial benefits through digital financial payment.

Source: proposed by this study (2017/11)

Next, this chapter discusses on the current situation of fraud in Taiwan, through the chart to sort out the official research data. According to the data content classification, we analyze the meaning behind the data.

2.1.1 The total number of fraud cases and cracked cases in Taiwan

This section provides information on fraud crimes in the 2011-2015 criminal case database provided by the Criminal Police Department of the Ministry of the Interior. From the comparison of the occurrence and the rates of solved fraud cases in Figure 2.2, the number of fraud cases can be found. The total number of cases was about 20,000 in 2011~2015, and the number of cracked cases was maintained at 15,000, the rate of solved cases has also remained above 60%. In 2015, the crack rate even rose to 84.82%, which shows that the police's efforts in cracking down on fraud-related illegal activities have been quite effective.

Table 2.2 The comparison of the occurrence and the cracking of fraud cases

Years	2011	2012	2013	2014	2015
Number of cases	23,612	20,421	18,772	23,053	21,172
Number of cases cracked	17,826	15,984	12,839	15,172	17,958
The crack rate	75.50%	78.27%	68.39%	65.81%	84.82%

Source: proposed by this study (2017/11)

In addition, the public believes that the attitude of police investigation has a considerable connection with the deterrence of fraud crimes, nearly 90% of the people

are willing to cooperate with the police. It is known that the people are willing to cooperate with the police to prevent fraud. In addition, more than 60% people agree with police investigations and the effectiveness and attitude of fraud prevention, and more than 70% of the public expressed their support for the “165 Anti-fraud Advisory Hotline” established by the police (Ministry of the Interior Police Department, 2007).

2.1.2 The ratio of telecom fraud cases accounting for the total number of fraud cases

From Table 2.3, it can be clearly found that telecommunications fraud cases remain high, mainly because of the scientific and transnational nature of their criminal methods, therefore, it can be expected that more fraud cases will be conducted through telecommunications channels in the future.

Table 2.3 The ratio of telecom fraud cases accounting for the total number of fraud cases

Years	2011	2012	2013	2014	2015
Telecom fraud cases	14,210	9,507	6,995	8,287	10,981
The total number of fraud cases	23,612	20,421	18,772	23,053	21,172
Ratio	60.18%	46.55%	37.26%	35.94%	51.86%

Source: proposed by this study (2017/11)

For that reason, in the face of group, specialization, technology, and transnational crime patterns, policing units must integrate all departments and use investigative

teams, investigation plans, investigation and execution, and cross-country coordination of management to become indispensable (Lin, 2013).

2.1.3 The ratio of the prosecution and non-prosecution

As shown in figure 2.1, the prosecution rate has decreased from 41.9% in 2011 to 37.7% in 2015, and then has risen to 39.2% in January-October 2016; the non-prosecution rate increased from 27.5% in 2011 to 33.1% in 2015, and from January to October 2016, it was reduced to 27.7% (Ministry of Justice, 2016).

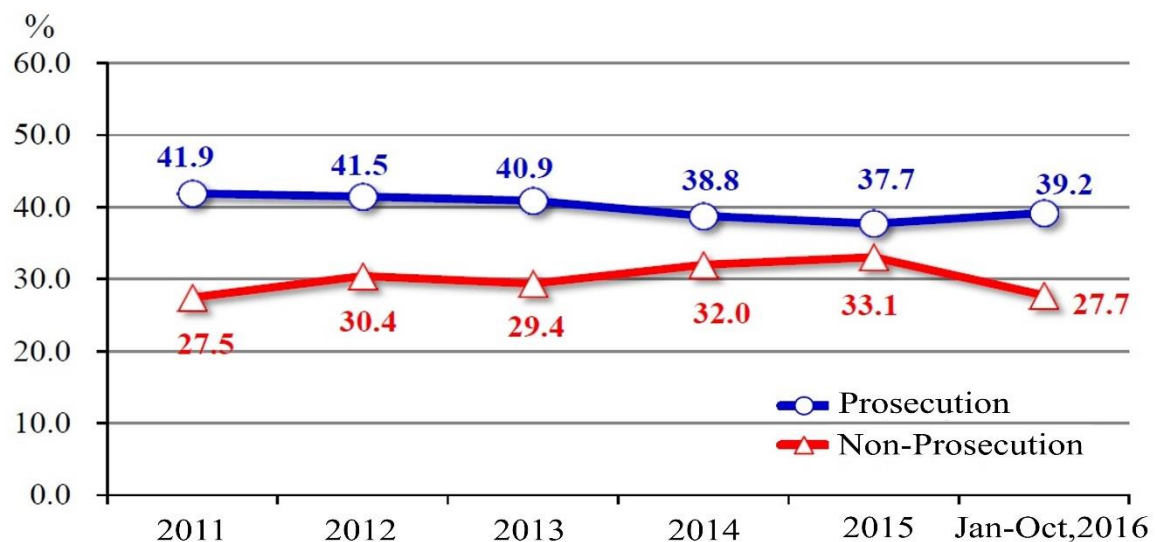


Figure 2.1 The ratio of the prosecution and non-prosecution

Source : proposed by this study (2017/11)

It can be seen from the above information that the reason why fraudulent cases are so rampant because even if they are cracked by the police, the rate at which the investigation may be prosecuted is still low, so fraudulent crimes remain an important issue for police in Taiwan.

2.1.4 The degree of loss of property in fraud cases

Next, in this section, we will focus on the analysis of the amount of property lost due to fraud cases, divide the number of financial losses, and summarize the number of cases in each interval and the total number of each interval ratio.

According to the statistics of the Criminal Police Department's statistics on the number of fraud cases in 2015, as can be seen from Table 2.4, the range of NT\$10,000 to NT\$100,000 is the maximum amount paid by the victims, with a total of 27.63% of cases; the second is the range of NT\$1,000 to 10,000, which is 20.86% (Ministry of the Interior Police Department, 2015 年).

Table 2.4 The degree of loss of property in fraud cases

Loss amount	Number of cases	Percentage
NT\$1 to 1,000	606	2.86%
NT\$1,000 to 10,000	4,417	20.86%
NT\$10,000 to 50,000	5,850	27.63%
NT\$50,000 to 150,000	3,543	16.73%
NT\$150,000 to 500,000	2,543	12.01%
NT\$500,000 or more	1,498	7.08%
No loss	2,715	12.82%
Total	21,172	100%

Source: proposed by this study (2017/11)

According to the statistics of the Criminal Police Department's statistics on the

number of fraud cases in 2015, it shows what are the most frequently used frauds: ATM release installment, fake online auction transaction and counterfeit, the number of cases is 2,978, 2,608, 2,493 respectively. The three frauds caused the total amount of financial losses to NT\$ 669,979,890. In addition, another statistic from the Criminal Police Department also pointed out that the loss caused by fraud in 2013 was as high as 3.71 billion. On average, each Taiwan person pays the fraud group nearly NT\$13,000.

2.1.5 The education level of the victims

Some research shows that the fraud group knows that communication technology is characterized by non-specificity, immediacy, anonymity, indirectness, specialization, cross-border, low risk and complexity. Therefore, it is still the main tool used by offenders to carry out various frauds. It has strategic alliances and clear division of labor between different members or groups. The victim is regardless of gender, age, or occupation. Everyone may become a victim of fraud, most of the victims are caused by psychological factors such as cheapness, demand, ignorance, sympathy, fear and trust (Chin-Chung Tseng, 2010).

The victims of high school graduation and university graduation, which accounted for the top two victims of fraud. The ratio is 40.49% for high school students and 25.35% for university graduation. This proves once again that everyone can become a victim of fraud regardless of gender, education level, age, and occupation (Ministry of the Interior Police Department, 2016)

2.2 Instant Messaging Software LINE Security Issues

With the rapid development of emerging technologies, significant changes have been found in various industries, including FinTech, Mobile Payment, Industry 4.0, and the Internet of Things, and various types of Mobile Applications, it has become an indispensable part of people's lives. In particular, the instant messaging software Line has almost replaced traditional telephones and become a new communication medium for Taiwanese people.

However, the instant messaging software Line often causes the account to be stolen, due to the consumer don't have the correct security concept and lacks security awareness. Or, by clicking on a malicious link, the user is at risk of leakage of personal data or financial loss.

Therefore, in the future, enterprises should pay more attention to the risks and impacts that instant messaging software may bring, it is imperative to provide more complete protection in advance to protect users' information security. This chapter briefly describes the current status of LINE in Taiwan and the common fraudulent methods on LINE.

2.2.1 The status of instant messaging software LINE in Taiwan

Since LINE launched its service in June 2011, it has been widely used in Japan, Taiwan, Thailand, India, Spain and other parts of the world. In just six months, the number of users worldwide has increased from 100 million to 200 million. Then in just 127 days, after the number of registered users of LINE exceeded 300 million in

the end of November 2013. Then, in less than five months, the number of registered users worldwide has reached 400 million. Subsequently, LINE was listed in the US and Japan in 2016. LINE is a very familiar instant messaging software for Taiwanese people (LINE official website, 2014).

As shown in Figure 2.2, according to a survey released by Nielsen in 2016, nearly 91% of Taiwanese people aged 12-65, and about 17 million people are frequent users of LINE.

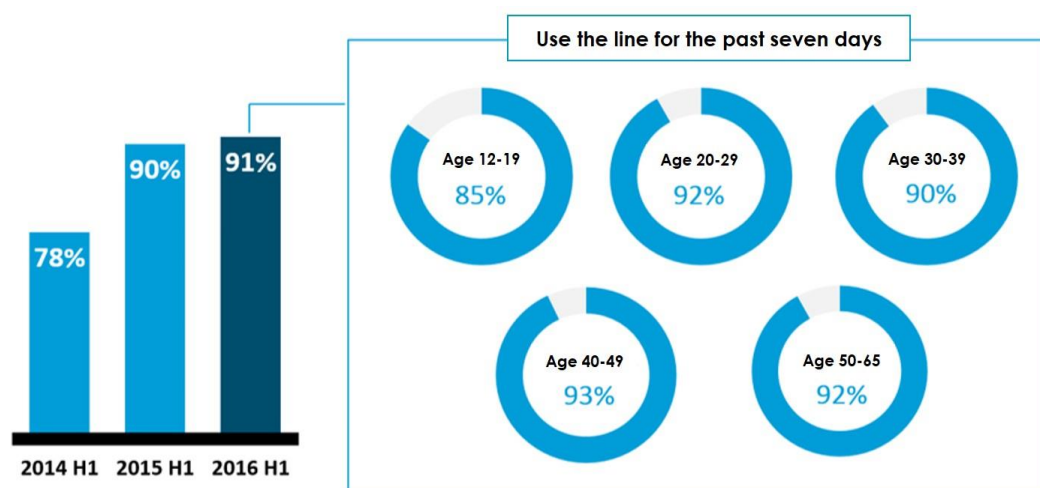


Figure 2.2 Taiwanese people use LINE ratio

Source : proposed by Nielsen (2016)

LINE has been able to quickly become popular in just six years, in addition to LINE's free text messaging, voice messaging, and voice calls. LINE also offers a comprehensive mobile platform service that spans multiple types such as LINE games, LINE BAND, and LINE Camera, which allow users to enjoy their unique mobile experience. Besides, the LINE official account service launched in 2012 from the beginning allows users to interact with their favorite artists through LINE, and the service was also extended to the enterprise later. Therefore, LINE's service scope also

spreads from the private community to the corporate network. These innovations make LINE no longer just a communication software, but a step by step into an action life platform, deep into the individual life and the various aspects of the corporate network. Taiwan has gradually formed a new generation of culture.

2.2.2 Two common frauds in instant messaging software LINE

Fraud incidents and methods on the Internet are constantly emerging. It is often known through the news media that Taiwanese people are frauded on LINE, resulting in huge personal property losses. Next, this study lists two common steps for fraud, as follows:

【Step1】Stealing the authentication code and successfully obtaining an account

The fraud group invades friend A's Facebook account or other communication software firstly, and ask your phone number in the name of friend A.

When the victim provides the phone number, the fraud group will use the function of registering the new account with the computer and input the mobile phone number provided by you. At this time, LINE will send a SMS authentication code to your mobile phone.

Next, the fraud group will falsely claim that his LINE must be re-logged in, and the authentication code must be provided to him. When you provide the fraudulent group with the four-digit authentication code in the newsletter, the fraud group successfully steals your LINE. And send a message to borrow money from relatives and friends. At this time, relatives and friends may be defrauded based on sympathy.

【Stsp2】 Impersonating relatives and friends

The Ministry of the Interior's Police Department said that "fake friends and relatives" is a method of the fraudulent group. After the fraudsters used the LINE accounts, they pretended victims to send messages to the friends list in a random selection, asking friends and relatives to send money for emergency.

In addition, according to the survey conducted by the Institute for Information Industry in the first half of 2014, the survey report of the “Top 100 Active Users of APP” conducted in Taiwan pointed out that LINE is the number one ranking for consumers using APP. The survey also found that because of the diversification of media content, users' attention and loyalty to the APP has been greatly reduced, but the social and communication APPs have been maintained because of the immediacy and community characteristics of the content. Although it has a high popularity, it also makes LINE a high-risk group of stolen identity (Top 100 Active Users of APP, 2014).

2.3 Perceived Risk

With the boom of information technology, online shopping has gradually become a mainstream consumer trend in this era. General mobile applications and instant messaging software LINE have many in-app purchasing options, most of these products are also purchased online. But because of the endless of telecommunication fraud incidents and the negative news related to the spread of media, the online shopping behavior will bring many unknown risks and harms. From the perspective of business management, research consumers online shopping behavior, it is one of the most important research topics to face and pay attention to which risks seem to affect

users' willingness to repurchase and their willingness to use.

This section first introduces the definition and facet of perceived risk, as well as the way in which scholars have defined the various facets of perceived risk in the past. Finally, the relevant applications of the perceived risk in the field of communication are compiled to serve as a reference for subsequent research.

2.3.1 Definition of perceived risk

The original concept of Perceived Risk was proposed by Harvard University's Bauer (1960), which was extended by the psychology field. He believes that the actions taken by consumers may not be able to know exactly whether the expected results are correct, and some results may make consumers unpleasant, which in turn affects consumer satisfaction with product use. Therefore, consumer purchasing decisions imply uncertainty outcome, and this uncertainty is the original concept of risk. From another perspective, all consumers make certain risks in their purchasing behavior decisions.

Cox (1967) continued Bauer's (1960) study and conceptualized perceived risk. Cox (1967) pointed out that consumers have their own purchase goals in every purchase, and consumers can't decide what factors (location, product, brand, style, size, color, etc.) can best meet their goals. Or after the purchase, it is found that the goods can not achieve the expected goal, which may result in unsatisfactory outcomes. This is the perceived risk. For the reason, Cox (1967) research concluded that the perceived risk can be explained by the following two functions:

1. Consumers before buying, recognize that the possibility of negative consequences after purchase.
2. When the purchase result is not satisfactory, the consumer is subjectively aware of the seriousness of the loss.

For example, “I am going to buy a bottle of milk, and the possibility to buy stinky milk”, it is a first type of risk; and “If I buy a stinky milk, and my family may have stomach ache when they eat stinky milk”, it is a second type of risk.

Cunningham (1967) refers to the first type of risk defined by Cox (1967) called the uncertainty factor, indicating the subjectivity of the consumer's possible occurrence of a certain thing; the second type of risk is called the consequence factor, indicating the risk of a negative outcome when an event occurs. In the future, most of the research on perceived risk is based on Cox and Cunningham's research. For example, Dowling & Staelin (1994) defined perceived risk as “When consumers make purchases, they are aware of uncertainty or negative and harmful results.”

Based on the literature of the above relevant scholars, this study defines the perceived risk as “Consumers in the process of purchasing goods or services, they may encounter some uncertainty risks or the possibility of loss of related interests.”

2.3.2 Facets of perceived risk

After Bauer (1960) put forward the theory that consumers have risks in the consumption process, many subsequent scholars' research also found that the perceived risk is composed of multiple facets, rather than a single factor. Although

perceived risk has different facets and meanings depending on the purpose of the research, many scholars agree that the perceived risk of consumers is a multi-faceted concept (Jacoby & Kaplan, 1972; Roselius, 1971). In the following, we will discuss the relevant facets of perceived risks among scholars in a time-ordered manner.

Cox (1967) first proposed that consumer perceptions are related to psychosocial or financial factors. The theory advocates that social psychological and financial factors affect consumers' perceived risk. Woodside (1968) believes that perceived risk consists of three measured facets: social, functional, and economic. Perry and Hamm (1969) differentiated the psychosocial factors mentioned by Cox (1967) into social factors and psychological factors and increased physical safety factors. The research by Jacoby and Kaplan (1972) proposes five types of risks: financial risk, performance risk, psychological risk, physical risk and social risk. Roselius (1971) proposed a time-risk facet that was not considered by other studies in addition to the above five risk facets, his main contribution is here. Peter and Tarpey (1975) combined the five facets of Jacoby and Kaplan (1972) with Roselius's (1971) time risk, there are six facets of financial risk, performance risk, physical risk, psychological risk, social risk and time risk, which are used to measure the perceived risk of consumers. Brooker (1984) also believes that perceived risk should include six facets in order to more accurately measure consumer perceived risk.

The above, in the facet of many perceived risks, Jacoby and Kaplan (1972) found five facet risks, such as financial risk, performance risk, physical risk, psychological risk, and social risk, these five facet risks have a 74% explanatory power for the overall perceived risk. Later, Stone and Gronhaug (1993) studied the five risk facets proposed by Jacoby and Kaplan (1972) and the time facet proposed by Roselius

(1971), the study found that the six risks of financial, performance, psychological, physical, social, and time have 88.8% explanatory power for the overall perceived risk.

Therefore, it is confirmed that these six risks are more complete perceived risk facets, and at the same time become the facet indicators used by follow-up scholars to measure perceived risks. For the reason, this study uses these six measurement aspects for the perceived risk of consumers and measures the perceived risk of consumers using the instant messaging software LINE in terms of financial, performance, physical, psychological, social and time.

Combining the past literature, this study also compiled the following operational definitions represented by the six perceived risk facets, as shown in Table 2.5.

Table 2.5 Operational definition of six perceived risk facets

Risk facet	Operational Definition
Financial risk	The behavior of use LINE, consumers will have a financial loss.
Performance risk	The effect of using LINE does not meet the expected performance.
Physical risk	The use of LINE will pose a health risk to the body.
Psychological risk	Using LINE will have a negative impact on self-perception
Social risk	The behavior of using LINE will affect how others feel about you.
Time risk	The risk of wasting time by using LINE

Source: proposed by this study (2017/11)

2.4 Willingness to Use

Motivation refers to an individual's internal driving force, which will prompt the user to take certain actions or behaviors (Lin Jianhuang, 2007). Therefore, motivation is an antecedent of individual actions or behaviors, indicating that motivation can be used to predict an individual's actions or behavior. However, sometimes it is difficult to actually measure the individual's behavior, so the alternative is to replace the individual's behavior with the intention of the behavior, that is, the behavioral intention can be adopted as an approximation of the actual behavior (Kimery & McCord, 2002).

In addition, according to Fishbein & Ajzen (1980), behavioral intentions refer to the subjective probability of an individual engaging in an action or behavior. From this concept extension, the willingness to use the instant messaging software LINE represents the probability that consumers are willing to use LINE.

When confronting with the perceived risk caused by a purchase or use behavior, the consumer may abandon the purchase or use behavior, that is, the perceived risk may directly affect the consumer's willingness to purchase (Garretson & Kenneth, 1999).

In addition, the telecom fraud experience is added as the moderator in this study, which also implies that the use of LINE's perceived risk facets has a negative impact on the willingness to use the instant messaging software LINE. Next, this section provides an in-depth summary and collation of the definition of willingness to use.

2.4.1 Definition of willingness to use

In general, the willingness to use refers to the degree of willingness of the user to use a service. Davis (1989) defines the willingness to use as the degree to which a user is willing to use a particular system. Bhattacharjee (2001) defines the willingness to use as the willingness of the user to use the system.

According to the Theory of Reasoned Action (TRA) proposed by the scholar Fishbein & Ajzen (1980), the willingness to use is the most important mediator variable for predicting the actual behavior of consumers, the behavior of consumers is directly driven by the willingness of consumers to use them. Although the willingness is not necessarily the same as the final actual action, the willingness to use formulates a positive relationship with most of the actual behavior. Therefore, it is also considered that the willingness to use refers to the willingness of the user to perform certain business activities.

Based on the literature of the above relevant scholars, and the purpose of this study will explore the willingness of Taiwanese consumers to use the instant messaging software LINE. Therefore, this study defines the willingness to use as “the willingness of Taiwanese consumers to use the instant messaging software LINE.”

Chapter 3 Research Method

In this chapter, we will first develop the research design process and steps, and conduct a more detailed discussion according to the execution method of each step and the limitations to be noted in order to select the method suitable for the research topic. This chapter is divided into five sections, the first section is to establish the research structure of this research based on the literature, the second section is to establish research hypotheses, the third section is the design of the formal questionnaire, which include the operational definition of the variables and the questionnaire measurement items, the fourth section is the method of data analysis, the last section is the pre-measurement results of the questionnaire.

3.1 Research framework

According to the research purpose of Chapter 1 and the literature review in Chapter 2, we understand that the six risk facets have 88% explanatory power for perceived risk. Therefore, this study uses six kinds of perceived risk facets commonly used in psychology, to explore consumers' willingness to use instant messaging software LINE.

In addition, according to the definition of the moderator, if the research wants to explore the correlation between the cause and the result, that is, the correlation between the independent variable and the dependent variable. And now there is a factor that often affects the independent variable and the dependent variable at the same time. The factor is called the moderator in research. For example, a study once

considered drinking alcohol to cause a higher risk of lung cancer, but the study also found that people with smoking habits often have a higher proportion of drinking habits. So, even if smoking habits are the real risk factors for lung cancer, drinking habits seem to have some uncertainty about the smoking habits and the risk of lung cancer. This is the moderator, and it is also suitable as a research topic to explore the issue of clarification.

Therefore, according to the research purpose of Chapter 1 and the literature review in Chapter 2, we know that telecommunication fraud is very popular in Taiwan, and the problem of fraud in Taiwan has been an important social issue that has been plagued by the government and the people in recent years. So, the telecommunication frauds experience is quite suitable as the moderator of this study.

The vulnerability of information security is also an important factor in making telecom fraud crimes popular in the Internet age. Therefore, all enterprises must prepare for security protection, otherwise it will affect the people's willingness to use the products and the future operation of the company.

It can be known from the incident of Yahoo's personal leakage in 2016, if company don't do the work of security protection, in addition to the company's product services may become a hotbed of telecom fraud, it will also cause consumers to lose confidence in the company's products. Therefore, it is very appropriate to use the telecommunication frauds experience as the moderator of this study. For the reason, the research framework proposed by this research is shown in Figure 3.1.

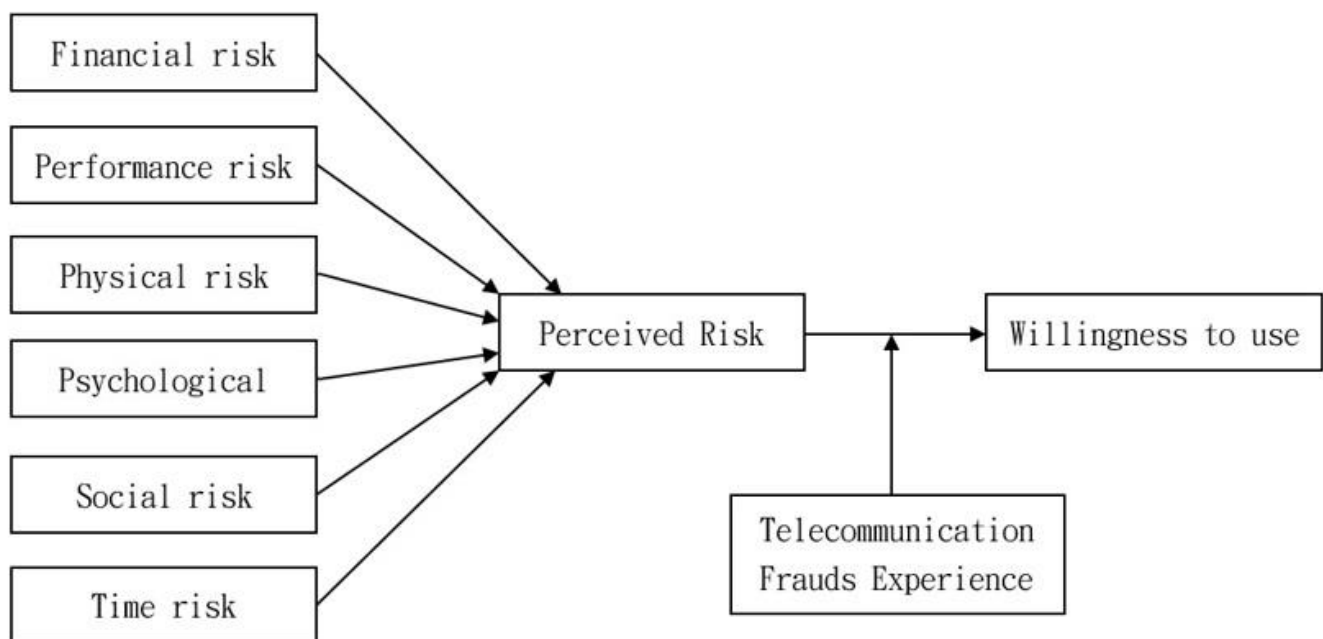


Figure 3.1 Research Framework

Source : proposed by this study (2017/11)

3.2 Research hypothesis

This section will be based on research scholar of literature in the past, and the perceived risk theory in this study cited it as a research basic. According to the research framework, there are eight variables in "financial risk", "performance risk", "physical risk", "psychological risk", "social risk", "time risk", "perceived risk" and "telecommunication frauds experience", then explore the possible relationships between the various variables. Therefore, the following eight hypotheses are proposed in this study.

From the previous literature, the risks perceived by consumers are often not real risks, so even if the real risks are non-existent or very low, once consumers are aware of the high risk of this behavior, it will affect their willingness to use and purchase

decisions. It can be seen that in any purchase situation, consumers face a certain uncertainty and insecurity about the products and services they purchase, and they are worried about the unfavorable results after purchase. Such perception is the perceived risk, which is related to individual behavior and the consumption situation will affect the purchase and use of consumers in the future (Lim, 2003). According to the above description, and in accordance with the subject of this study, the H1 hypothesis is proposed:

H1: The “Financial Risk” of consumers when using LINE, it will have a positive impact on “Perceived Risk”.

It can be seen from the past literature that the factors affecting consumer satisfaction are the difference between the expectation of the product and the actual purchase, that is, the interaction between the expectation and the actual performance, the result will be a consumer satisfaction or dissatisfaction with the use of these behavioral intents that will influence future consumer assessment decisions and willingness to use (Loudon & Della, 1984). According to the above description, and in accordance with the subject of this study, the H2 hypothesis is proposed:

H2: The “Performance Risk” of consumers when using LINE, it will have a positive impact on “Perceived Risk”.

From the previous literature, the subjective knowledge and objective knowledge of the product will directly affect the risk of consumers generating uncertain factors, which means that consumers may not be able to predict the risk of health caused by the use of the product, such as physical risk (Deon Klerck, 2007). According to the

above description, and in accordance with the subject of this study, the H3 hypothesis is proposed:

H3: The “Physical Risk” of consumers when using LINE, it will have a positive impact on “Perceived Risk”.

According to Robert (1993), the sum of the risks caused by the uncertainty factors such as the six facets of perceived risk can be regarded as the overall perceived risk of consumers, and its research suggests that psychological risks directly affect the overall risk. In addition, Tser-yieth Chen (2004) also pointed out that commodity quality has a significant impact on psychological risk. Deon Klerck's (2007) empirical study also pointed out that psychological risks affect the behavior and decision-making of consumers' purchase and use. This means that if the instant messaging software LINE is not effective in blocking spam mail and advertising messages, or after using the instant messaging software LINE service, there will be privacy concerns on personal information or communication content, these reasons have the potential to cause consumers to be at psychological risk. According to the above description, and in accordance with the subject of this study, the H4 hypothesis is proposed:

H4: The “Psychological Risk” of consumers when using LINE, it will have a positive impact on “Perceived Risk”.

From the past literature, consumers often buy goods in order to obtain the identity of the group. This is a kind of behavior that is similar to other members in order to obtain the identity of the group and meet the expectations of the group. This

behavior is a kind of herd behavior (Lechner And Hummel, 2002). Indirectly affecting consumers' willingness to use through trust or attitude (Hsu and Chiu, 2004).

Therefore, this study intends to understand, whether the subjective norms formed by the opinions or ideas of consumers and relatives around the Taiwan market have a certain degree of influence on consumers' purchasing and using attitudes. This means that consumers will pay special attention to the vision and behavior of others and when using the instant messaging software LINE, or they may consider the harm that may be caused to others after using the instant messaging software LINE. It is a social risk. According to the above description, and in accordance with the subject of this study, the H5 hypothesis is proposed:

H5: The “Social Risk” of consumers when using LINE, it will have a positive impact on “Perceived Risk”.

The instant messaging software LINE provides a comprehensive mobile platform service, including games, shopping, communication, and video, so it is easy to delay waiting, and it is easy for consumers to indulge in software, resulting in a loss of time. Non-monetary pay is also a cost concept, the cost includes not only the monetary cost of the actual purchase, it also includes additional non-monetary costs such as time, physical strength, and spirit (Monroe and Krishnan, 1985; Zeithaml, 1988). According to the above description, and in accordance with the subject of this study, the H6 hypothesis is proposed:

H6: The “Time Risk” of consumers when using LINE, it will have a positive impact on “Perceived Risk”.

Perceived risk is one of the intangibles that consumers bear when purchasing, it is called Psychic cost, it is a non-monetary sacrifice, which is inversely related to perceived value. Therefore, the higher the consumer's perceived risk to a product, the lower the perceived value of the product, and the consumer's willingness to purchase and use will also decrease (Wood and Scheer, 1996). The consumer's purchase behavior is not sure that the expected result is in line with expectations, and some of the results are more likely to be unpleasant. In other words, perceived risk may cause obstacles to the user's use behavior (Bauer, 1960). According to the above description, and in accordance with the subject of this study, the H7 hypothesis is proposed:

H7: The “Perceived Risk” of consumers when using LINE, it will have a negative impact on “Willingness to Use”.

The mobile market has offered a leap in growth and brought huge business opportunities to the communications industry. If the telecommunication fraud problem cannot be effectively suppressed, it would directly affect the future consumer environment, this means that consumers' willingness to use may be reduced (Song, 2007). Therefore, this study is intended to explore the consumer's perceived risk and whether it will interfere with the willingness to use the instant messaging software LINE because of the experience of telecommunication frauds. According to the above description, and in accordance with the subject of this study, the H8 hypothesis is proposed:

H8: The “Telecommunication frauds experience” of consumers when using LINE, it will have a negative impact on “Willingness to Use”.

3.3 Survey Design

Based on the research objectives of Chapter 1, the literature review in Chapter 2, the research hypotheses in section 2 of Chapter 3, this study quantifies the relationship between the user's perceived risk and the user's willingness to use the instant messaging software LINE, and exploit online questionnaire as the main data collection method.

According to past research, the relationship between the level points of the scale and the reliability of the question, in practice, Jenkins & Taber (1977) believe that the reliability is the best when using five points as the scale. Therefore, this questionnaire adopts the Likert five-point scale, to give 5 to 1 point from "totally agree", "partly agree", "no comment", "partly disagree" and "totally disagree", and ask the subject to check the degree of consent for each question to measure within the scale.

3.3.1 Questionnaire content

The questionnaire is divided into ten sections, including "Personal basic information", "Financial Risk", "Performance Risk", "Physical Risk", "Psychological Risk", "Social Risk", "Time Risk", "Perceived Risk", "Telecommunication frauds experience" and "Willingness to Use". The questionnaire pattern of this study can be divided into the following three parts, which are explained as follows:

(1) Experience and usage habit of subjects

In the first part, it is mainly to investigate the experience and usage habits of the subjects, and whether there is a transaction through the instant messaging software

LINE, so as to facilitate the fluency of subsequent answers.

(2) Personal basic information

In the second part, it is mainly to confirm whether the subjects are the main objects of this study, and to classify them. Personal basic information includes gender, place of residence, age, education level, industry and disposable income.

(3) The measuring question of nine research variables

In the research model of this study, there are nine research variables including "Financial Risk", "Performance Risk", "Physical Risk", "Psychological Risk", "Social Risk", "Time Risk", "Perceived Risk", "Telecommunication frauds experience" and "Willingness to Use".

In the third part, there will be four questions for each research variable, for a total of thirty-six questions. The entire questionnaire will use the Likert five-point scale for subsequent statistical analysis, to give 5 to 1 point from "totally agree", "partly agree", "no comment", "partly disagree" and "totally disagree". The measuring questions of research variables will be explained in the next section.

3.3.2 The operational definition and the measuring question of research variable

This section will explain the operational definitions and measuring questions for each research variable in the research framework, the research variables of this research questionnaire are based on different literatures, each research variable is referred to the relevant literature, and the operational definition and the measuring

question are performed. The explanation is as follows.

(1) Financial Risk

According to the past literature, in any purchase situation, consumers have an uncertain and insecure feeling about the products and services which they purchase, they are worried about the unfavorable results after purchase. Such perception is the perceived risk, which is related to individual behavior, and the consumption situation will affect the purchase and use of consumers in the future (Lim, 2003).

Therefore, this study defines financial risk as the risk of financial loss caused by using of LINE, which means that consumers think it is not worth spending so much money to buy the service or the product through LINE, consumers will feel this risk. The measuring questions of financial risk is shown in Table 3.1.

Table 3.1 The measuring questions of financial risk

Research variable	Measuring questions
Financial Risk	1. I will worry about trading through LINE, and find the goods is not worth the money.
	2. I worry about the loss of money after I have paid for the transaction through LINE, and I have not received the goods.
	3. I will worry about trading through LINE, credit card information will be stolen and caused financial losses.
	4. I will worry about trading through LINE, personal identity information will be stolen and caused financial losses.

(2) Performance Risk

According to the past literature, the factors affecting consumer satisfaction are the difference between the expectation of the product and the actual purchase, that is, the interaction between the expectation and the actual performance, and the result is that the consumer will be satisfied or dissatisfied, these behavioral intents will influence consumer assessment decisions and willingness to use in the future (Loudon & Della, 1984).

Therefore, this study defines performance risk as the risk of using LINE that does not perform as expected, it means that consumers believe that the services carried out through LINE do not achieve the expected benefits or objectives, consumers will feel this risk. The measuring questions of performance risk is shown in Table 3.2.

Table 3.2 The measuring questions of performance risk

Research variable	Measuring questions
Performance Risk	<ol style="list-style-type: none">1. After purchasing a stickers or related products through LINE, I am worried that the product is not in use as originally expected.2. After purchasing a stickers or related product through LINE, I am worried that the function of the product cannot meet my needs.3. I am worried about the outcome of LINE's video and call, which can't meet my communication quality requirements.4. I am worried that LINE's transmission restrictions or compatibility issues with the file, which can't meet my communication needs.

(3) Physical Risk

From the past literature, the subjective knowledge and objective knowledge of products, which directly affect the risk of consumers generating uncertain factors, such as physical risks (Deon Klerck, 2007).

Therefore, this study defines physical risk as the risk that excessive use of LINE may cause harmful health. This means that when consumers overuse LINE and ignore the damage that may be caused by physical factors, consumers will feel this risk. The measuring questions of physical risk is shown in Table 3.3.

Table 3.3 The measuring questions of physical risk

Research variable	Measuring questions
Physical Risk	1. After using the LINE service for a long time, I am worried about the physical discomfort such as eyes and muscles.
	2. After using the LINE service for a long time, I am worried about physical discomfort such as poor sleep quality and dizziness.
	3. After using the LINE service for a long time, I am worried that it will affect my daily routine and diet.
	4. After using the LINE service for a long time, I am worried that I will induce Internet addiction related to 3C products.

(4) Psychological risk

According to past literature, Deon Klerck (2007) also pointed out that psychological risk affects the behavior and decision-making of consumers' purchase and use. In addition, some scholars believe that psychological risk means that the website will invade the privacy of consumers, and cause consumers to be reluctant to provide personal information to the website (Jacobs, 1997; Forsythe & Shi, 2003).

Therefore, this study defines psychological risk as the risk of negative impact on personal privacy and self-awareness when using LINE. This means that consumers will feel this risk if the product or service they purchase cannot satisfy the consumer's own self-demand, cause the consumer to have a negative idea, or regret buying the product, consumers will feel this risk. The measuring questions of psychological risk is shown in Table 3.4.

Table 3.4 The measuring questions of psychological risk

Research variable	Measuring questions
Psychological Risk	1. After using the LINE service, I am worried about the negative emotions of anxiety caused by excessive spam notifications.
	2. After using the LINE service, I am worried about the negative emotions of anxiety about excessive work notifications and friend messages.
	3. After using the LINE service, I am worried about privacy concerns, includes videos, photos, and text content.
	4. After using the LINE services, I am worried about privacy concerns, including personal data and transaction information.

(5) Social risk

From the past literature, consumers often buy goods in order to obtain the identity of the group. This is a kind of behavior that is similar to other members in order to meet the expectations of the group. This behavior is a kind of herd behavior (Lechner And Hummel, 2002). Indirectly affecting consumers' "willingness to use" through trust, or indirectly affect the "willingness to use" through attitudes (Hsu and Chiu, 2004).

Therefore, this study defines social risk as the risk of using LINE to influence the perception of others. It means this study expects to understand that in the Taiwan market, subjective norms formed by the views or ideas of relatives, whether it also has a certain degree of influence on consumers' attitudes toward purchase and use. The measuring questions of social risk is shown in Table 3.5.

Table 3.5 The measuring questions of social risk

Research variable	Measuring questions
Social Risk	1. After trading through LINE, I am worried that the product or service will not be recognized by my family or friends.
	2. After using LINE's services excessively, I am worried about letting my family or friends have a negative perception of myself.
	3. I am worried that using LINE will lead to the theft of personal identity information, which in turn will bring threats to family or friends.
	4. I am worried that using LINE will cause personal health hazards, which will put a burden on my family or friends.

(6) Time risk

According to the past literature, non-monetary pay is also a cost concept. The cost includes not only the cost of money for actual purchase, but also the cost of time, physical strength, spirit. (Monroe and Krishnan, 1985; Zeithaml, 1988).

Therefore, this study defines time risk as the risk of wasting time by using LINE. It means that instant messaging software LINE provides a comprehensive mobile platform service, including games, shopping, communication, and video, so it is easy to delay, and it is easy to be overly obsessed with software, and cause time loss, consumers will feel this risk. The measuring questions of time risk is shown in Table 3.6.

Table 3.6 The measuring questions of time risk

Research variable	Measuring questions
Time Risk	1. I am worried about spending too much time, find or browse favorite products on the instant messaging software LINE.
	2. I am worried about spending too much time, chat with friends on the instant messaging software LINE.
	3. I am worried about spending too much time, play mobile games or watch video entertainment on the instant messaging software LINE.
	4. I am worried about spending too much time, watch news or ads on the instant messaging software LINE.

(7) Perceived risk

According to the past literature, the perceived risk of consumer online shopping is higher than physical retail store. Because consumers can't check the product before they actually get the product or use the service, and can't evaluate the quality of their sales service. Therefore, there are many risks that have not appeared in physical storefront shopping (Hong and Yi, 2012). And the perceived risks of consumers, sometimes not a real risk, so even if the real risk is not there or very low, once consumers recognize that this risk is high, it will affect their willingness to purchase decisions (Yu-Fen Chen, 2011).

Therefore, this study defines perceived risk as the consumers cannot predict the impact of purchasing decisions or the consumers cannot predict the uncertainty danger that may be faced, consumers will feel this risk. The measuring questions of time risk is shown in Table 3.7.

Table 3.7 The measuring questions of perceived risk

Research variable	Measuring questions
Perceived Risk	1. In general, I feel that using the instant messaging software LINE is risky for personal privacy. 2. In general, I feel that trading through the instant messaging software LINE is risky. 3. In general, I feel that excessive use of instant messaging software LINE is risky for physical and mental health. 4. In general, I feel that excessive use of instant messaging software LINE is risky to waste time.

(8) Telecommunication frauds experience

According to past literature, telecommunication fraud is the use of traditional local calls, mobile phones, Internet telephone, computers, and the Internet as tools to engage in fraud (Pei-yu Qiu, 2011). Telecommunication fraud causes economic losses to individuals or telecommunications companies, and also affects telecommunications order. (Song, 2007).

Therefore, this study defines telecommunication frauds experience, that is, consumers have been contacted to various types of fraud during the use of LINE. It is mean, consumers will have a negative impact on the willingness to use the instant messaging software LINE, because of the experience of telecommunication frauds. The measuring questions of telecommunication frauds experience is shown in Table 3.8.

Table 3.8 The measuring questions of telecommunication frauds experience

Research variable	Measuring questions
Telecommunication Frauds Experience	1. On the instant messaging software LINE, I have received unknown messages from unknown accounts.
	2. On the instant messaging software LINE, I have received various messages sent by fake friends and relatives.
	3. On the instant messaging software LINE, I have received unreasonable product discount advertisements from unknown accounts.
	4. On the instant messaging software LINE, I have received various messages sent by the official account of fake brands.

(9) Willingness to use

According to past literature, Fishbein & Ajzen (1980) pointed out the willingness to use is the subjective will of the consumer to use a particular product or service, it also reflects positively correlated indicators of the products or services that consumers use. Willingness to use refers to the motivation and willingness of an individual to take a particular action (Ajzen, 1985). Willingness to use affects consumer behavior, and encourages consumers to take action to meet demand (Engel & Blackwell & Miniard, 1995).

Therefore, this study defines the term “willingness to use”, which is the consumer's willingness to use the instant messaging software LINE, and also represents the probability that consumers will continue to use LINE in the future. The measuring questions of willingness to use is shown in Table 3.9.

Table 3.9 The measuring questions of willingness to use

Research variable	Measuring questions
Willingness to Use	1. In the future, I will still use the instant messaging software LINE.
	2. In the future, I have a positive view of using instant messaging software LINE.
	3. Compared to other instant messaging software, I tend to continue to use the instant messaging software LINE.
	4. In general, my willingness to use the services of the instant messaging software LINE is high.

3.4 Analysis method

This study is aimed at users who use instant messaging LINE, and use the online questionnaire to collect sample data. This questionnaire uses the Likert five-point scale to allow respondents to answer questionnaire options, after the questionnaire is collected, the invalid questionnaire will be deleted and the effective questionnaire will be analyzed.

The data analysis tool used in this study is SPSS17.0 (Statistical Package for Social Science), this software is a statistical software. This study uses SPSS17.0 to conduct relevant statistical analysis of the effective questionnaires, to verify whether the various hypotheses established in this study are true, and further explain the relationship between variables. Finally, this study will understand the actual situation of telecommunication frauds experience for instant messaging software LINE. The statistical analysis methods used in this study include the following four.

3.4.1 Descriptive statistics

The descriptive statistics used in general research, usually include: Frequency Distribution, Rates, Mean, Standard Deviation, etc. For the valid samples recovered in this study, this study used descriptive statistical analysis of the demographic characteristics of the sample. To simplify the complexity of the data for the benefit of following analysis, so we take some action to understand the structure of the subject's demographic variables.

3.4.2 Confirmatory factor analysis (CFA)

Factor analysis can be divided into Exploratory factor analysis (EFA) and Confirmatory Factor Analysis (CFA). The confirmatory factor analysis(CFA) is that the researchers have already understood the rational architecture, and then used collecting data to verify the relationship between the latent variable and the observed variable, and then establish a structural model (Haw-Jeng Chiou, 2006).

When constructing the model, the CFA mode allows for correlation between factors, and can verify whether the rational mode is appropriate based on the collected data. This is the goodness-of-fit test, if there is sufficient fitness support, this structural model will be accepted. If it is not supported, it will be rejected (Wann-Yih Wu, 2000). This study used Amos for analysis.

3.4.3 Reliability and validity analysis

In order to achieve the goal of "good measurement", this study will not only use the statistical methods of confirmatory factor analysis to maintain the quality of the questions in the scale, but also use the reliability and validity analysis methods to establish the reliability, effectiveness and correctness.

(1) Reliability Analysis

Reliability Analysis is to measure the reliability and stability of each research variable in the questionnaire answering option, that is, to check whether the questions in the study are consistent, the higher the reliability, the higher the consistency of the test results (Chen, 2000). Reliability is the degree to which the result is measured or

not, it is also the consistency of the test results (Wann-Yih Wu, 2000).

In general, the indicators of measurement reliability can be divided into multiple types, and this study uses the most common value Cronbach's α to measure. If Cronbach's α value is greater than 0.7, it is high confidence, while 0.7-0.35 is medium confidence, and below 0.35 is low confidence. In general research, the scholar Nunnally (1978) suggested that the application of Cronbach's α value in practice should be at least greater than 0.5, and preferably greater than 0.7. According to Cuieford (1965), when Cronbach's α value is greater than 0.6, the reliability passes and has a reference value. If it is greater than 0.7, the reliability is high.

(2) Validity Analysis

The purpose of Validity Analysis is to know whether the question of the questionnaire can really measure the facet of the study. That is, the correctness of the measurement. Validity means that a questionnaire can really measure the extent to which the research wants to be empirical, that is, the questionnaire that can achieve the measurement purpose is effective (Chen, 2005). Yu & Tsai & Zhuang (2012) mentioned that the validity analysis is divided into three types. Content Validity, Criterion-Related Validity, and Construct Validity, among them, construct validity is the most important.

Construct validity is the degree to which the questionnaire can measure the concept or trait of the theory. Detecting construct validity, the most commonly used factor analysis, this method uses fewer facets to represent the more complex data structures. In factor analysis, related studies often use KMO Test and Bartlett's Sphericity Test to examine the correlation between variables and variables.

According to Kaiser (1974), KMO value need to be greater than 0.5, indicating that the higher the commonality, suitable for factor analysis; the closer the Bartlett value is to 0, the more significant it is, which is suitable for factor analysis. From the above, this study will use "constructive validity" as the main method to examine and enhance the validity of data.

3.4.4 Structural equation modeling (SEM)

The structural equation model (SEM) is a multivariate statistical analysis method for higher statistics, and it is a method that can be used to deal with causal relation patterns. It has been widely used in many research fields such as psychology, sociology, economics, management, communication, consumer behavior and education. In the multivariate analysis method, most analysis methods can only deal with the relationship between a set of independent variables and one dependent variable at a time. However, SEM effectively integrates "factor analysis" and "path analysis", therefore, the relationship between multiple sets of independent variables and multiple sets of dependent variables can be processed simultaneously.

The most important concept of SEM consists of two parts, the first part is the Measurement Model, it is used to measure the relationship between observation variable and latent variable; The second part is the Structure Model, it is used to explore the relationship between latent variable (Haw-Jeng Chiou, 2006). This study mainly uses the operation and application of AMOS software for verification analysis.

3.5 Pretest results

After the questionnaire design, before a large number of tests have been formally implemented, it is a pretest to find a group of subjects to take the test. The number of samples in the pre-test does not need to be too large. What is important is whether the subject can provide meaningful feedback.

Because most of the measuring questions in this study are derived from conceptual definitions. Therefore, it is necessary to conduct a pretest survey in advance and based on the pretest results of the questionnaire. It can correct the description of each measurement question and to improve the overall quality of the formal questionnaire.

The pre-test questionnaire was issued from April 4, 2018 to April 10, 2018. The total time for testing was 7 days, and the actual number of samples recovered was 52. After removing 2 invalid samples, the actual valid samples are 50. The pre-test questionnaires used reliability and validity analysis statistical methods to establish the reliability, effectiveness and correctness of the questionnaire.

In the reliability part, the Cronbach's α values of each research variable are greater than 0.6 from Table 3.10. According to the study by Cuieford (1965), when the Cronbach's α value is greater than 0.6, the reliability passes through the reference value. This questionnaire has certain reliability, and the questions of each research variable are consistent and reliable.

Table 3.10 Cronbach's α value for each variable (Pretest)

Variable	Cronbach's α
Financial Risk	0.846
Performance Risk	0.726
Physical Risk	0.836
Psychological Risk	0.619
Social Risk	0.683
Time Risk	0.916
Perceived Risk	0.670
Telecommunication Frauds	0.794
Experience	0.848
Willingness to Use	0.848

In the validity part, from Table 3.11, it indicates that all of the KMO values are greater than 0.5. According to Kaiser's (1974) research, the KMO value needs to be greater than 0.5, indicating that the higher the commonality, the more suitable for factor analysis.

In the Bartlett value part, all are 0.00, which is significant, and is also suitable for factor analysis, which means that the questionnaire is highly effective.

Table 3.11 Validity analysis table (Pretest)

Variable	KMO	Bartlett
Financial Risk	0.688	0.000
Performance Risk	0.559	0.000
Physical Risk	0.710	0.000
Psychological Risk	0.535	0.000
Social Risk	0.611	0.000
Time Risk	0.790	0.000
Perceived Risk	0.542	0.000
Telecommunication Frauds	0.651	0.000
Experience		
Willingness to Use	0.800	0.000

Chapter 4 Analysis and discussion of research results

This chapter uses statistical software SPSS 17.0 and AMOS for analysis. This chapter analyzes and summarizes the collected questionnaire data and verifies whether the research hypothesis could be accepted. The first section is the overall descriptive statistics analysis, and the second section is the reliability and validity analysis, the third section is the descriptive statistics analysis of variables, the fourth section is the confirmatory factor analysis. Finally, the fifth section is the analysis of the structural equation model.

4.1 Descriptive statistics analysis of sample data

In this study, the questionnaire was designed by the professional cloud questionnaire service “SurveyCake”. The survey period was from April 13, 2018 to April 22, 2018, for a total of 10 days. The questionnaire distribution channels were mainly Facebook community platform and LINE group.

The total number of questionnaires collected was 555 copies. After the invalid samples were deleted, the actual number of valid samples was 520. The recovery rate of the questionnaire was 93.6%. This study used two methods to delete invalid samples. In the first way, the subject did not use the sample of the instant messaging software LINE, so the sample was deleted. In the second way, if the subject's questionnaire answers are almost the same, the sample is also deleted.

4.1.1 Personal basic information

This study uses valid samples in a descriptive statistics analysis. First, we analyze the demographic variables, and then the subject's experience of using the instant messaging software LINE.

Table 4.1 shows the number of times the subject's personal basic data is allocated. The content is gender, age, education level, monthly disposable income, occupations, and place of residence.

In the gender part of the subject, the ratio of male to female is not much different, each accounting for half of the proportion. In the age group, most of them fall in the age of 21-30, the proportion is about 71.5%, indicating that the subjects are generally young.

In the education level, most of the subjects have education level above the university level, 56.9% of the university, and 39.2% of the institute. In the monthly disposable income, it is the majority of NT\$10,000 or less, accounting for about 39.2%.

In the occupational part, the proportion of students is the highest, about 50.6%, secondly, the manufacturing and service industries are the main ones, accounting for 11.3% and 10.0% respectively. Finally, the proportion of the current residential area is the highest in the Tainan area, with a ratio of approximately 53.8%.

Table 4.1 Personal data of subjects (1)

Heading	Item	Number of samples (N=520)	
		Sample	Percentage (%)
Gender	Male	257	49.4
	Female	263	50.6
Age	Under 20 years old	64	12.3
	21~30 years old	372	71.5
	31~40 years old	58	11.2
	41~50 years old	20	3.8
	51~60 years old	6	1.2
	60 years old or older	0	0.0
Education Level	Primary school	0	0.0
	Secondary school	0	0.0
	Junior High school	20	3.8
	University	296	56.9
	Institute	204	39.2
Monthly Disposable Income	NT\$10,000 or less	204	39.2
	NT\$10,001~20,000	103	19.8
	NT\$20,001~30,000	70	13.5
	NT\$30,001~40,000	77	14.8
	NT\$40,001~50,000	31	6.0
	NT\$50,001 or more	35	6.7
Occupations	Student	263	50.6
	Agriculture husbandry	5	1.0
	Manufacturing	59	11.3
	Business/Financial	30	5.8
	Catering	5	1.0
	Service industry	52	10.0
	Medical industry	8	1.5
	Home management	0	0.0
	Military/Civil servant	32	6.2
	Mass communication	3	0.6
	Retirement/unemployment	13	2.5
	Other	50	9.6

Table 4.1 Personal data of subjects (2)

Heading	Item	Number of samples (N=520)	
		Sample	Percentage (%)
Place of residence	Taipei	36	6.9
	New Taipei	31	6.0
	Keelung	2	0.4
	Taoyuan	20	3.8
	Hsinchu	10	1.9
	Miaoli	3	0.6
	Changhua	11	2.1
	Taichung	56	10.8
	Nantou	1	0.2
	Yunlin	7	1.3
	Chiayi	13	2.5
	Tainan	280	53.8
	Kaohsiung	34	6.5
	Pingtung	6	1.2
	Hualien	1	0.2
	Taitung	0	0.0
	Yilan	1	0.2
	Islands area	1	0.2
	Other	1	0.2

4.1.2 Subject's experience with LINE

Table 4.2 shows the subject's experience with instant messaging software LINE, with descriptive statistics analysis by frequency distribution. The heading s are shown in Table 4.2.

Before performing the analysis in this section, some invalid questionnaires were deleted, therefore, in the first question, "Have you used instant messaging software

LINE?", 100% of the subjects have used it.

In the part of "Have you ever had experience buying goods on the LINE?", because of the defined purchasing experience in this study, includes ways to redeem stickers and purchase goods at the LINE store. Therefore, up to 79.4% of the respondents indicated that they have experience in purchasing goods on the instant messaging software LINE.

In the part of the "How long have you been using the instant messaging software LINE?", as many as 86.3% of the respondents indicated that they have used LINE for more than 3 years.

In the part of the "How often do you use the instant messaging software LINE?", up to 95.6% of the respondents indicated that they use LINE several times a day.

Finally, in the part of the "How much time do you spend on the daily use of instant messaging software LINE?", the number of subjects who use one hour to two hours per day is the biggest, the proportion is about 31.5%, and secondly, use more than three hours a day, the ratio is about 27.3%.

This statistical results also verify the contents of the second chapter of the literature review. This means that there are already a lot of users of instant messaging software LINE in Taiwan, and these users are also happy to use the services of instant messaging software LINE.

Table 4.2 Subject's experience with LINE

Heading	Item	Number of samples (N=520)	
		Sample	Percentage (%)
Have you used instant messaging software LINE?	Yes	520	100
	no	0	0
Have you ever had experience buying goods on the LINE?	Yes	413	79.4
	no	107	20.6
How long have you been using the instant messaging software LINE?	Less than half a year	5	1.0
	Half a year - One year	2	0.4
	One year - Two years	24	4.6
	Two years - Three years	40	7.7
	More than three years	449	86.3
How often do you use the instant messaging software LINE?	Several times a day	497	95.6
	Once a day	12	2.3
	Once a few days	9	1.7
	Once a month	1	0.2
	Once a few months	1	0.2
How much time do you spend on the daily use of instant messaging software LINE?	Less than an hour	134	25.8
	One hour - two hours	164	31.5
	Two hours - three hours	80	15.4
	More than three hours	142	27.3

4.2 Reliability and validity analysis of sample data

In order to achieve the goal of "good measurement", this study will not only use the statistical methods of confirmatory factor analysis to maintain the quality of the questions in the scale, but also use the reliability and validity analysis methods to establish the reliability, effectiveness and correctness.

In this section, we carried out the reliability and validity analysis of the questionnaire sample. In the part of reliability analysis, the Cronbach's α value is used to test the reliability level of the questionnaire.

In the part of validity analysis, the KMO Test and Bartlett's Sphericity Test will be used for detecting. This section uses the statistical software SPSS 17.0 to perform the test, and explain the results after the analysis.

4.2.1 Reliability Analysis

In general, the indicators of measurement reliability can be divided into multiple types, and this study uses the most common value Cronbach's α to measure. In general research, the scholar Nunnally (1978) suggested that the application of Cronbach's α value in practice should be at least greater than 0.5, and preferably greater than 0.7. According to Cuieford (1965), when Cronbach's α value is greater than 0.6, the reliability passes and has a reference value. If it is greater than 0.7, the reliability is high.

(1) Financial risk

From Table 4.3, the Cronbach's α value of financial risk is 0.840. If the Cronbach's α value is greater than 0.7, it means that it has high reliability. Therefore, the measuring questions of financial risk is in line with the standard.

Table 4.3 Reliability analysis table of financial risk

Research variable	Cronbach's α	Measuring questions	Cronbach's α if item deleted
Financial Risk	0.840	1. I will worry about trading through LINE, and find the goods is not worth the money.	0.836
		2. I worry about the loss of money after I have paid for the transaction through LINE, and I have not received the goods.	0.805
		3. I will worry about trading through LINE, credit card information will be stolen and caused financial losses.	0.766
		4. I will worry about trading through LINE, personal identity information will be stolen and caused financial losses.	0.778

(2) Performance risk

From Table 4.4, the Cronbach's α value of performance risk is 0.751. If the Cronbach's α value is greater than 0.7, it means that it has high reliability. Therefore, the measuring questions of performance risk is in line with the standard.

Table 4.4 Reliability analysis table of performance risk

Research variable	Cronbach's α	Measuring questions	Cronbach's α if item deleted
Performance Risk	0.751	1. After purchasing a stickers or related products through LINE, I am worried that the product is not in use as originally expected.	0.680
		2. After purchasing a stickers or related product through LINE, I am worried that the function of the product cannot meet my needs.	0.658
		3. I am worried about the outcome of LINE's video and call, which can't meet my communication quality requirements.	0.717
		4. I am worried that LINE's transmission restrictions or compatibility issues with the file, which can't meet my communication needs.	0.715

(3) Physical risk

From Table 4.5, the Cronbach's α value of physical risk is 0.879. If the Cronbach's α value is greater than 0.7, it means that it has high reliability. Therefore, the measuring questions of physical risk is in line with the standard.

Table 4.5 Reliability analysis table of physical risk

Research variable	Cronbach's α	Measuring questions	Cronbach's α if item deleted
Physical Risk	0.879	1. After using the LINE service for a long time, I am worried about the physical discomfort such as eyes and muscles.	0.840
		2. After using the LINE service for a long time, I am worried about physical discomfort such as poor sleep quality and dizziness.	0.818
		3. After using the LINE service for a long time, I am worried that it will affect my daily routine and diet.	0.844
		4. After using the LINE service for a long time, I am worried that I will induce Internet addiction related to 3C products.	0.877

(4) Psychological risk

From Table 4.6, the Cronbach's α value of psychological risk is 0.719. If the Cronbach's α value is greater than 0.7, it means that it has high reliability. Therefore, the measuring questions of psychological risk is in line with the standard.

Table 4.6 Reliability analysis table of psychological risk

Research variable	Cronbach's α	Measuring questions	Cronbach's α if item deleted
Psychological Risk	0.719	1. After using the LINE service, I am worried about the negative emotions of anxiety caused by excessive spam notifications.	0.728
		2. After using the LINE service, I am worried about the negative emotions of anxiety about excessive work notifications and friend messages.	0.660
		3. After using the LINE service, I am worried about privacy concerns, includes videos, photos, and text content.	0.605
		4. After using the LINE services, I am worried about privacy concerns, including personal data and transaction information.	0.632

(5) Social risk

From Table 4.7, the Cronbach's α value of social risk is 0.759. If the Cronbach's α value is greater than 0.7, it means that it has high reliability. Therefore, the measuring questions of social risk is in line with the standard.

Table 4.7 Reliability analysis table of social risk

Research variable	Cronbach's α	Measuring questions	Cronbach's α if item deleted
Social Risk	0.759	1. After trading through LINE, I am worried that the product or service will not be recognized by my family or friends.	0.692
		2. After using LINE's services excessively, I am worried about letting my family or friends have a negative perception of myself.	0.659
		3. I am worried that using LINE will lead to the theft of personal identity information, which in turn will bring threats to family or friends.	0.782
		4. I am worried that using LINE will cause personal health hazards, which will put a burden on my family or friends.	0.664

(6) Time risk

From Table 4.8, the Cronbach's α value of time risk is 0.851. If the Cronbach's α value is greater than 0.7, it means that it has high reliability. Therefore, the measuring questions of time risk is in line with the standard.

Table 4.8 Reliability analysis table of time risk

Research variable	Cronbach's α	Measuring questions	Cronbach's α if item deleted
Time Risk	0.851	1. I am worried about spending too much time, find or browse favorite products on the instant messaging software LINE.	0.802
		2. I am worried about spending too much time, chat with friends on the instant messaging software LINE.	0.854
		3. I am worried about spending too much time, play mobile games or watch video entertainment on the instant messaging software LINE.	0.781
		4. I am worried about spending too much time, watch news or ads on the instant messaging software LINE.	0.802

(7) Perceived risk

From Table 4.9, the Cronbach's α value of the perceived risk is 0.780. If the Cronbach's α value is greater than 0.7, it means that it has high reliability. Therefore, the measuring questions of perceived risk is in line with the standard.

Table 4.9 Reliability analysis table of perceived risk

Research variable	Cronbach's α	Measuring questions	Cronbach's α if item deleted
Perceived Risk	0.780	1. In general, I feel that using the instant messaging software LINE is risky for personal privacy.	0.709
		2. In general, I feel that trading through the instant messaging software LINE is risky.	0.724
		3. In general, I feel that excessive use of instant messaging software LINE is risky for physical and mental health.	0.723
		4. In general, I feel that excessive use of instant messaging software LINE is risky to waste time.	0.750

(8) Telecommunication frauds experience

From Table 4.10, the Cronbach's α value of the telecommunication frauds experience is 0.746. If the Cronbach's α value is greater than 0.7, it means that it has high reliability. Therefore, the measuring questions of telecommunication frauds experience is in line with the standard.

Table 4.10 Reliability analysis table of telecommunication frauds experience

Research variable	Cronbach's α	Measuring questions	Cronbach's α if item deleted
Telecommunication Frauds Experience	0.746	1. On the instant messaging software LINE, I have received unknown messages from unknown accounts.	0.725
		2. On the instant messaging software LINE, I have received various messages sent by fake friends and relatives.	0.748
		3. On the instant messaging software LINE, I have received unreasonable product discount advertisements from unknown accounts.	0.612
		4. On the instant messaging software LINE, I have received various messages sent by the official account of fake brands.	0.651

(9) Willingness to use

From Table 4.11, the Cronbach's α value of willingness to use is 0.894. If the Cronbach's α value is greater than 0.7, it means that it has high reliability. Therefore, the measuring questions of willingness to use is in line with the standard.

Table 4.11 Reliability analysis table of willingness to use

Research variable	Cronbach's α	Measuring questions	Cronbach's α if item deleted
Willingness to Use	0.894	1. In the future, I will still use the instant messaging software LINE.	0.879
		2. In the future, I have a positive view of using instant messaging software LINE.	0.875
		3. Compared to other instant messaging software, I tend to continue to use the instant messaging software LINE.	0.850
		4. In general, my willingness to use the services of the instant messaging software LINE is high.	0.845

4.2.2 Validity Analysis

The purpose of Validity Analysis, it is to know whether the question of the questionnaire can really measure the facet of the study. That is, the correctness of the measurement. Construct validity is the degree to which the questionnaire can measure the concept or trait of the theory. Detecting construct validity, the most commonly used factor analysis, this method uses fewer facets to represent the more complex data structures. In factor analysis, related studies often use KMO Test and Bartlett's Sphericity Test to examine the correlation between variables and variables.

According to Kaiser (1974), KMO value need to be greater than 0.5, indicating that the higher the commonality, suitable for factor analysis; the closer the Bartlett value is to 0, the more significant it is, which is suitable for factor analysis. From the above, this study will use "constructive validity" as the main method to examine and enhance the validity of data.

From Table 4-12, it can be seen all of the KMO values are greater than 0.5. According to Kaiser (1974), KMO value need to be greater than 0.5, indicating that the higher the commonality, suitable for factor analysis, representing this questionnaire is highly effective.

From Table 4-12, it can be seen all of the Bartlett value are 0.00, which is significant, suitable for factor analysis. The main function of factor analysis is to simplify and condense complex construction, and to efficiently help researchers to make the most appropriate measurements.

Table 4.12 Validity analysis table of research variables

Research variable	KMO value	Bartlett value
Financial Risk	0.697	0.000
Performance Risk	0.590	0.000
Physical Risk	0.796	0.000
Psychological Risk	0.600	0.000
Social Risk	0.693	0.000
Time Risk	0.794	0.000
Perceived Risk	0.671	0.000
Telecommunication Frauds	0.715	0.000
Experience	0.830	0.000
Willingness to Use	0.830	0.000

4.3 Descriptive statistics of research variables

This section is based on the samples collected from the questionnaire, to conduct a descriptive statistical analysis of the measuring questions, as well as an analysis of the mean value and standard deviation.

Measuring questions include financial risk, performance risk, physical risk, psychological risk, social risk, time risk, perceived risk, telecommunication frauds experience, and willingness to use. This section performs the test with the statistical software SPSS 17.0, and then explain the results after the calculation analysis.

(1) Financial risk

As can be seen from Table 4.13, the overall average for financial risk is 3.500. In the part of the measurement question, the mean value of "I will worry about trading through LINE, personal identity information will be stolen and caused financial losses." is 3.854, which is the highest. This result shows that for consumers, financial risk is a major concern for the use of instant messaging software LINE, in which the financial losses caused by the theft of personal data are most concerned by users.

Table 4.13 Descriptive statistics of the measuring questions of financial risk

Measuring questions	Mean value	Standard deviation	Ranking
Financial risk	3.500		
1. I will worry about trading through LINE, and find the goods is not worth the money.	3.473	0.912	3
2. I worry about the loss of money after I have paid for the transaction through LINE, and I have not received the goods.	3.296	1.111	4
3. I will worry about trading through LINE, credit card information will be stolen and caused financial losses.	3.765	1.027	2
4. I will worry about trading through LINE, personal identity information will be stolen and caused financial losses.	3.854	0.955	1

(2) Performance risk

As can be seen from Table 4.14, the overall average for performance risk is 3.264. In the part of the measurement question, the mean value of "I am worried that LINE's transmission restrictions or compatibility issues with the file, which can't meet my communication needs." is 3.590, which is the highest. This result shows that for consumers, performance risk is a little noticeable when using instant messaging software LINE. Among them, the communication function and efficiency of instant messaging software LINE, which is the most important concern of users.

Table 4.14 Descriptive statistics of the measuring questions of performance risk

Measuring questions	Mean value	Standard deviation	Ranking
Performance risk	3.264		
1. After purchasing a stickers or related products through LINE, I am worried that the product is not in use as originally expected.	3.108	1.026	3
2. After purchasing a stickers or related product through LINE, I am worried that the function of the product cannot meet my needs.	3.070	1.059	4
3. I am worried about the outcome of LINE's video and call, which can't meet my communication quality requirements.	3.290	1.118	2
4. I am worried that LINE's transmission restrictions or compatibility issues with the file, which can't meet my communication needs.	3.590	1.051	1

(3) Physical risk

As can be seen from Table 4.15, the overall average for physical risk is 3.041. In the part of the measurement question, the mean value of "After using the LINE service for a long time, I am worried that I will induce Internet addiction related to 3C products." is 3.212, which is the highest. This result shows that for consumers, the physical risk is a link that is less noticeable when using the instant messaging software LINE.

Table 4.15 Descriptive statistics of the measuring questions of physical risk

Measuring questions	Mean value	Standard deviation	Ranking
Physical risk	3.041		
1. After using the LINE service for a long time, I am worried about the physical discomfort such as eyes and muscles.	3.158	1.125	2
2. After using the LINE service for a long time, I am worried about physical discomfort such as poor sleep quality and dizziness.	3.027	1.132	3
3. After using the LINE service for a long time, I am worried that it will affect my daily routine and diet.	2.767	1.116	4
4. After using the LINE service for a long time, I am worried that I will induce Internet addiction related to 3C products.	3.212	1.173	1

(4) Psychological risk

As can be seen from Table 4.16, the overall average for psychological risk is 3.502. In the part of the measurement question, the mean value of "After using the LINE services, I am worried about privacy concerns, including personal data and transaction information." is 3.875, which is the highest. This result shows that for consumers, psychological risk is a factor that will be strongly watched when using instant messaging software LINE, especially in the face of doubts about privacy leakage. So, in the psychological risk, consumers usually have a positive view of agree.

Table 4.16 Descriptive statistics of the measuring questions of psychological risk

Measuring questions	Mean value	Standard deviation	Ranking
Psychological risk	3.502		
1. After using the LINE service, I am worried about the negative emotions of anxiety caused by excessive spam notifications.	3.006	1.083	4
2. After using the LINE service, I am worried about the negative emotions of anxiety about excessive work notifications and friend messages.	3.358	1.094	3
3. After using the LINE service, I am worried about privacy concerns, includes videos, photos, and text content.	3.771	0.959	2
4. After using the LINE services, I am worried about privacy concerns, including personal data and transaction information.	3.875	0.926	1

(5) Social risk

As can be seen from Table 4.17, the overall average for social risk is 2.897. In the part of the measurement question, the mean value of "I am worried that using LINE will lead to the theft of personal identity information, which in turn will bring threats to family or friends." is 3.551, which is the highest. This result shows that for consumers, social risk is a factor that does not have much feeling when using instant messaging software LINE. But when the risk of the fraud event is harmful to the family or friends, users usually have a positive view of agree in social risk.

Table 4.17 Descriptive statistics of the measuring questions of social risk

Measuring questions	Mean value	Standard deviation	Ranking
Social risk	2.897		
1. After trading through LINE, I am worried that the product or service will not be recognized by my family or friends.	2.612	0.944	3
2. After using LINE's services excessively, I am worried about letting my family or friends have a negative perception of myself.	2.565	1.007	4
3. I am worried that using LINE will lead to the theft of personal identity information, which in turn will bring threats to family or friends.	3.551	0.982	1
4. I am worried that using LINE will cause personal health hazards, which will put a burden on my family or friends.	2.860	1.067	2

(6) Time risk

As can be seen from Table 4.18, the overall average for time risk is 2.834. In the part of the measurement question, the mean value of "I am worried about spending too much time, chat with friends on the instant messaging software LINE." is 3.298, which is the highest. This result shows that for consumers, most consumers spend the most time using chat function on the LINE, which also shows that LINE has indeed replaced some of the telecommunications operators' services, including voice calls and messaging services.

Table 4.18 Descriptive statistics of the measuring questions of time risk

Measuring questions	Mean value	Standard deviation	Ranking
Time risk	2.834		
1. I am worried about spending too much time, find or browse favorite products on the instant messaging software LINE.	2.661	1.135	3
2. I am worried about spending too much time, chat with friends on the instant messaging software LINE.	3.298	1.162	1
3. I am worried about spending too much time, play mobile games or watch video entertainment on the instant messaging software LINE.	2.717	1.149	2
4. I am worried about spending too much time, watch news or ads on the instant messaging software LINE.	2.658	1.125	4

(7) Perceived risk

As can be seen from Table 4.19, the overall average for perceived risk is 3.909.

In the part of the measurement question, the mean value of "In general, I feel that trading through the instant messaging software LINE is risky." is 3.881, which is the highest. This result shows that for consumers, the overall perceived risk is an issue that is strongly concerned and valued when using the instant messaging software LINE. Therefore, the average of the four measuring questions has a very positive agreement.

Table 4.19 Descriptive statistics of the measuring questions of perceived risk

Measuring questions	Mean value	Standard deviation	Ranking
Perceived risk	3.709		
1. In general, I feel that using the instant messaging software LINE is risky for personal privacy.	3.823	0.811	2
2. In general, I feel that trading through the instant messaging software LINE is risky.	3.881	0.820	1
3. In general, I feel that excessive use of instant messaging software LINE is risky for physical and mental health.	3.479	0.957	4
4. In general, I feel that excessive use of instant messaging software LINE is risky to waste time.	3.651	0.991	3

(8) Telecommunication frauds experience

As can be seen from Table 4.20, the overall average for telecommunications fraud experience is 3.454. In the part of the measurement question, the mean value of "On the instant messaging software LINE, I have received unknown messages from unknown accounts." is 3.875, which is the highest. This result shows that for consumers, the experience of telecommunication frauds is particularly sensation when using LINE, which echoes the content of the second chapter of literature review. The means of frauds will progress with the advancement of technology. Therefore, LINE can strengthen the prevention of unknown accounts or fake accounts in the future.

Table 4.20 Descriptive statistics of the measuring questions of telecom frauds experience

Measuring questions	Mean value	Standard deviation	Ranking
Telecommunication frauds experience	3.454		
1. On the instant messaging software LINE, I have received unknown messages from unknown accounts.	3.875	1.200	1
2. On the instant messaging software LINE, I have received various messages sent by fake friends and relatives.	3.037	1.357	4
3. On the instant messaging software LINE, I have received unreasonable product discount advertisements from unknown accounts.	3.492	1.274	2
4. On the instant messaging software LINE, I have received various messages sent by the official account of fake brands.	3.412	1.278	3

(9) Willingness to use

As can be seen from Table 4.21, the overall average for willingness to use is 4.041. In the part of the measurement question, the mean value of "In the future, I will still use the instant messaging software LINE." is 4.289, which is the highest. This result shows that for most consumers, when using LINE, although there may be some risks, these risks are not likely to affect the consumer's willingness to use LINE. Therefore, in the average of the four measuring questions, there is a positive view of agree to totally agree.

This also echoes the second chapter of the literature review. In Taiwan, 90% of the Taiwanese people are users of LINE, and these consumers are also happy to use LINE services, and the future will continue.

Table 4.21 Descriptive statistics of the measuring questions of willingness to use

Measuring questions	Mean value	Standard deviation	Ranking
Willingness to use	4.041		
1. In the future, I will still use the instant messaging software LINE.	4.289	0.733	1
2. In the future, I have a positive view of using instant messaging software LINE.	3.919	0.796	4
3. Compared to other instant messaging software, I tend to continue to use the instant messaging software LINE.	4.000	0.862	2
4. In general, my willingness to use the services of the instant messaging software LINE is high.	3.956	0.814	3

4.4 Confirmatory factor analysis of sample data (CFA)

Confirmatory factor analysis refers to the premise of a certain theoretical framework, in order to confirm the relevance between the research variables and each measuring question. Therefore, before the structural equation model analysis, the confirmatory factor analysis, which is used to examine whether each research variable has a good measurement quality.

This study uses a confirmatory factor analysis to measure the “Component reliability”, “Convergent validity” and “Discriminant validity” of variables. According to the recommendations of Bagozzi & Yi (1998), the factor loading of each measuring question should be between 0.5 to 0.95. In the preliminary analysis of the confirmatory factor analysis, four measuring questions PR3, PR4, PSR1 and PSR2 were found, which did not meet the criteria of 0.50 to 0.95, so they were deleted to improve the overall model fit. As shown in Table 4.22, it can be found that the factor loading of each measuring question is between 0.50 to 0.95.

According to Fornell and Larcker (1981), if the scale has good convergent validity, the Composite Reliability (CR) needs to be greater than 0.60. The CR represents the composition of the reliability of all measurement variables in a potential variable. If the composite reliability is higher, it indicates that the measurement variable has higher degree of potential variable. The Average Variance Extracted (AVE) needs to be greater than 0.50. The AVE is to calculate the average variance explanatory power of each measurement variable for the potential variable. If the AVE is higher, it indicates that the higher the reliability and convergent validity of the potential variable.

However, according to the relationship between the sample size and the factor loading amount proposed by the Hair (1998), if the sample numbers are greater than 350, the AVE value can be accepted so long as it reaches 0.40. The 520 valid samples in this study have reached the above criteria, so the AVE value of this study is greater than 0.40 as the standard. In addition, Zhang (2011) pointed out that the AVE value of 0.36 or more is acceptable.

As shown in Table 4.22, it can be found that the CR values of this study are all greater than 0.60, and the AVE values are all greater than 0.40, so this study has good convergent validity.

Table 4.22 Analysis of Convergent Validity (1)

Research variable	Items	Standardized factor loading	Standard errors	CR	AVE
Financial Risk (FR)	FR1	0.540	0.708	0.841	0.582
	FR2	0.630	0.603		
	FR3	0.910	0.172		
	FR4	0.900	0.190		
Performance Risk (PR)	PR1	0.890	0.208	0.889	0.801
	PR2	0.900	0.190		
Physical Risk (PHR)	PHR1	0.840	0.294	0.865	0.621
	PHR2	0.900	0.190		
	PHR3	0.780	0.392		
	PHR4	0.600	0.640		

Table 4.22 Analysis of Convergent Validity (2)

Research variable	Items	Standardized factor loading	Standard errors	CR	AVE
Psychological Risk (PSR)	PSR3	0.780	0.392	0.853	0.746
	PSR4	0.940	0.116		
Social Risk (SR)	SR1	0.680	0.538	0.768	0.458
	SR2	0.740	0.452		
	SR3	0.510	0.740		
	SR4	0.750	0.438		
Time Risk (TR)	TR1	0.780	0.392	0.855	0.599
	TR2	0.640	0.590		
	TR3	0.850	0.278		
	TR4	0.810	0.344		
Perceived Risk (OPR)	OPR1	0.84	0.294	0.784	0.488
	OPR2	0.82	0.328		
	OPR3	0.56	0.686		
	OPR4	0.51	0.740		
Telecommunication Frauds Experience (TCF)	TCF1	0.55	0.698	0.761	0.454
	TCF2	0.51	0.740		
	TCF3	0.83	0.311		
	TCF4	0.75	0.438		
Willingness to Use (WTU)	WTU1	0.76	0.422	0.896	0.684
	WTU2	0.77	0.407		
	WTU3	0.88	0.226		
	WTU4	0.89	0.208		

In order to confirm that the data collected in this study can be effectively estimated, before the structural equation model analysis, the confirmatory factor analysis was performed with AMOS 25.0 for nine research variables. This study is based on the study of Bagozzi and Yi (1998) and Hair et al. (1998), as a criterion for the model goodness of fit. The model goodness of fit index can be divided into Absolute fit indices, Incremental fit indices, and Parsimonious fit indices. The absolute fit indices include χ^2/df , GFI and RMSEA. The incremental fit indices include AGFI, NFI, NNFI and CFI. The parsimonious fit indices include PNFI and PGFI. The analysis result and judgment criteria are shown in Table 4.23.

Table 4.23 The model fit of confirmatory factor analysis

Indicators	Criteria	Value
χ^2/df	≤ 3 means satisfactory fit	4.161
	$3 < \chi^2/df < 5$ means acceptable fit	
RMSEA	≤ 0.08 is good	0.078
GFI	GFI ≥ 0.8 is good	0.809
AGFI	AGFI ≥ 0.8 is good	0.765
NFI	NFI ≥ 0.9 means satisfactory fit	0.817
	$0.8 < \text{NFI} < 0.9$ means acceptable fit	
NNFI	NNFI ≥ 0.9 means satisfactory fit	0.831
	$0.8 < \text{NNFI} < 0.9$ means acceptable fit	
CFI	CFI ≥ 0.9 means satisfactory fit	0.854
	$0.8 < \text{CFI} < 0.9$ means acceptable fit	
PNFI	> 0.5 is good	0.705
PGFI	> 0.5 is good	0.737

The only non-standard in this study was the AGFI value of 0.765, although slightly less than 0.8, but according to Segars and Grover (1993), it is still allowed to further test the substantive relationship of the research variables. Because the model goodness of fit index is affected by many factors, including model setting, sample size, model complexity, parameter estimation, data normality, and the reliability and validity of the research variables. Therefore, the absolute fit indices, incremental fit indices, and parsimonious fit indices of this research theory, which are all within acceptable levels.

When the convergent validity meets the criteria, then the discriminant validity is used to examine whether there is a significant difference between the research variables. If the measurement model has discriminant validity, the degree of relationship between the potential research variables, must be less than the degree of relationship within the potential research variables, so the correlation matrix is used to verify the relationship between the research variables.

According to Hair et al. (1998), the correlation coefficient between two different research variables, must be less than the square root of the AVE value for each research variable.

As shown in Table 4.24, the square root of the AVE value of the research variables in this study is greater than the correlation coefficient between the different research variables, this indicates that the correlation between each research variable is low, and this study has discriminant validity. The measurement mode results of this study have both reliability and validity. Therefore, the quality of this study is very good.

Table 4.24 Analysis of the discriminant validity

Research variable	FR	PR	PHR	PSR	SR	TR	OPR	TCF	WTU
FR	0.763								
PR	0.561	0.895							
PHR	0.245	0.227	0.788						
PSR	0.446	0.385	0.421	0.864					
SR	0.427	0.399	0.469	0.497	0.678				
TR	0.186	0.179	0.488	0.381	0.431	0.774			
OPR	0.496	0.332	0.490	0.551	0.406	0.429	0.699		
TCF	0.168	0.205	0.126	0.260	0.211	0.215	0.257	0.674	
WTU	0.062	0.007	0.039	0.043	0.009	0.056	0.087	0.115	0.827

4.5 Analysis of structural equation modeling (SEM)

A total of 520 subjects were collected in this study, and the path relationship between the variables was examined by AMOS 25.0. According to the research of Bagozzi and Yi (1998) and Hair et al. (1998), as the criteria for the model goodness of fit index of SEM. Analytical data and criteria are shown in Table 4-25.

From Table 4-25, we can see the absolute fit indices χ^2/df , GFI and RMSEA, the incremental fit indices AGFI, NFI, NNFI and CFI, the parsimonious fit indices PNFI and PGFI, and all of them match with acceptable standards. Therefore, the sample data of this study and the overall model of the SEM are well fitted.

Table 4.25 The overall model fit of the SEM

Indicators	Criteria	Value
X^2/df	≤ 3 means satisfactory fit	2.832
	$3 < X^2/df < 5$ means acceptable fit	
RMSEA	≤ 0.08 is good	0.076
GFI	$GFI \geq 0.8$ is good	0.837
AGFI	$AGFI \geq 0.8$ is good	0.800
NFI	$NFI \geq 0.9$ means satisfactory fit	0.838
	$0.8 < NFI < 0.9$ means acceptable fit	
NNFI	$NNFI \geq 0.9$ means satisfactory fit	0.869
	$0.8 < NNFI < 0.9$ means acceptable fit	
CFI	$CFI \geq 0.9$ means satisfactory fit	0.887
	$0.8 < CFI < 0.9$ means acceptable fit	
PNFI	> 0.5 is good	0.718
PGFI	> 0.5 is good	0.668

The SEM path diagram results of this study are shown in Figure 4-1. Detailed analytical data is listed in Table 4-26, and the verification results and hypothetical significance are verified by the T value.

Next, we analyze and discuss the results and research hypotheses presented in Figures 4.1 and Table 4.26, and focus on the correlation of "financial risk", "performance risk", "physical risk", "psychological risk", "social risk", "time risk", "perceived risk", "telecommunication frauds experience" and "willingness to use", and the analysis results of each research variable will be described one by one.

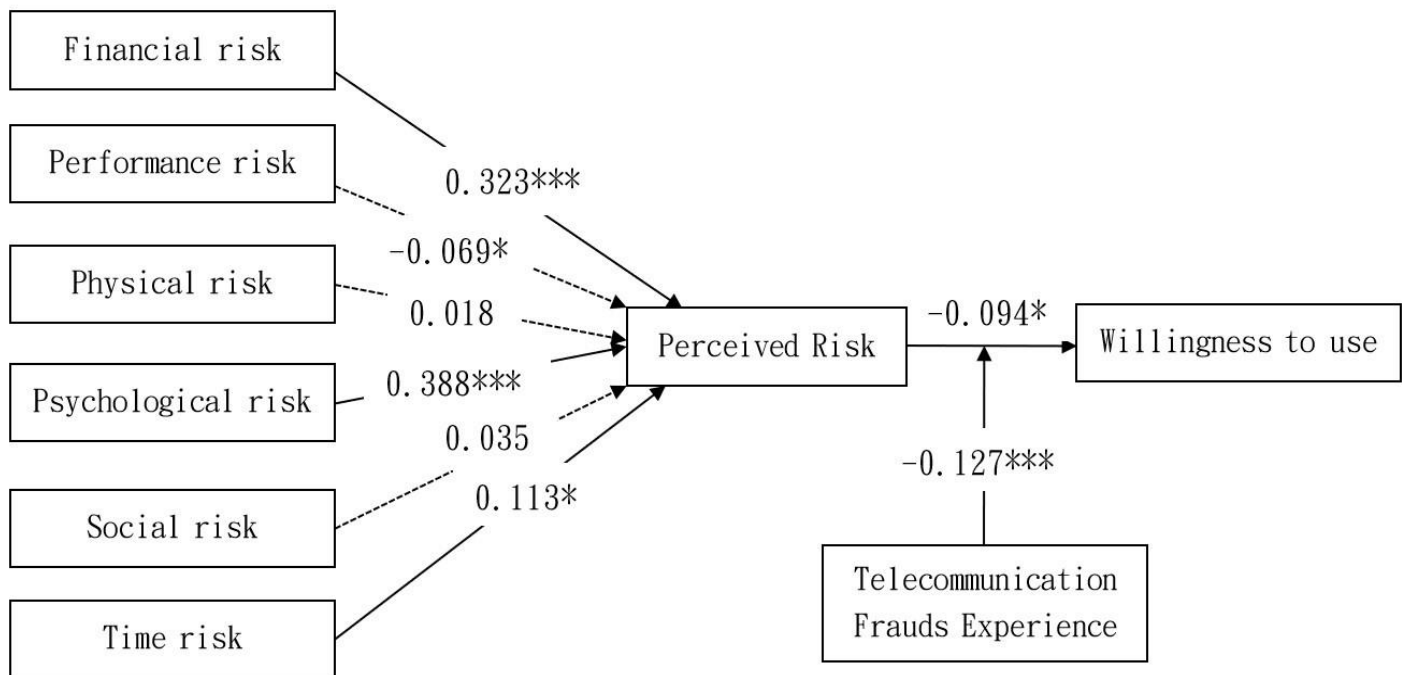


Figure 4.1 The path diagram of SEM

Source: proposed by this study (2018/04)

(1) The relationship between financial risk and perceived risk

According to the analysis results, the relationship between financial risk and perceived risk has a standardized path coefficient of 0.323, which is positive and significant. This means that the higher the financial risk of consumer using LINE, the higher the overall perceived risk of consumer using instant messaging software LINE. Therefore, the H1 hypothesis of this study is supported.

(2) The relationship between performance risk and perceived risk

According to the analysis results, the relationship between performance risk and perceived risk has a standardized path coefficient of -0.069, which is a negative impact. This means that the higher the performance risk of consumers using LINE, the perceived risk of consumers using LINE will not be significantly increased, which

means that most consumers use the instant messaging software LINE experience is good. Therefore, the H2 hypothesis of this study is not supported.

(3) The relationship between physical risk and perceived risk

According to the analysis results, the relationship between physical risk and perceived risk has a standardized path coefficient of 0.018, which is positive but not significant. It means that the higher the physical risk of the consumer using LINE, the overall perceived risk will not be significantly higher, which means that the physical risk is not a factor that the consumer will pay special attention to. Therefore, the H3 hypothesis of this study is not supported.

(4) The relationship between psychological risk and perceived risk

According to the analysis results, the relationship between psychological risk and perceived risk has a standardized path coefficient of 0.388, which is positive and significant. It indicates that the higher the psychological risk of consumers using LINE, the higher the overall perceived risk of consumers using the instant messaging software LINE. Therefore, the H4 hypothesis of this study is supported.

(5) The relationship between social risk and perceived risk

According to the analysis results, the relationship between social risk and perceived risk has a standardized path coefficient of 0.035, which is positive but not significant. This means that the higher the social risk of consumer using LINE, the consumer's overall perceived risk of LINE will not be significantly increased, which also means that most users will not pay special attention to the pressure of society when using LINE. Therefore, the H5 hypothesis of this study is not supported.

(6) The relationship between time risk and perceived risk

According to the analysis results, the relationship between time risk and perceived risk has a standardized path coefficient of 0.113, which is a positive impact. This means that the higher the time risk of consumer using LINE, the higher the overall perceived risk of consumer using the instant messaging software LINE. Therefore, the H6 hypothesis of this study is supported.

(7) The relationship between perceived risk and willingness to use

According to the analysis results, the relationship between perceived risk and willingness to use has a standardized path coefficient of -0.094, which is negative but significant. This means that the higher the perceived risk of the consumer using LINE, the lower the user's willingness to use the instant messaging software LINE, which is consistent with the research hypothesis. Therefore, the H7 hypothesis of this study is supported.

(8) The relationship between telecom frauds experience and willingness to use

According to the analysis results, the relationship between telecommunication frauds experience and willingness to use has a standardized path coefficient of -0.127, which is negative and very significant. This means that when consumers have telecommunication frauds experience on LINE, their willingness to use the instant messaging software LINE may be reduced, which is consistent with the research hypothesis. Therefore, the H8 hypothesis of this study is supported.

Table 4.26 Analysis results of the overall path

Hypothesis	Path	Path coefficient	t value
H1	Financial risk → Perceived risk	0.323	6.607 ***
H2	Performance risk → Perceived risk	-0.069	-1,716 *
H3	Physical risk → Perceived risk	0.018	0.274
H4	Psychological risk → Perceived risk	0.388	6.960 ***
H5	Social risk → Perceived risk	0.035	0.537
H6	Time risk → Perceived risk	0.113	2.531 *
H7	Perceived risk → Willingness to use	-0.094	2.026 *
H8	Telecommunication frauds experience → Willingness to use	-0.127	-4.473 ***

*** means P value <0.001 , ** means P value <0.01 , *means P value <0.1

Based on the above results, the relationship between the variables of the study is shown in Table 4-27.

According to the results, financial risk, psychological risk and time risk have a positive and significant impact on perceived risk, which is consistent with the research hypothesis; while perceived risk and telecommunication frauds experience have negative and significant influence on the willingness to use, and also meet the research hypothesis.

In the hypothesis of this study, the hypothesis of H1, H4, H6, H7 and H8 are all valid, while the hypothesis of H2, H3 and H5 are not valid. In view of this, five of the eight hypotheses in this study are established.

Table 4.27 Results table of research hypothesis

	Research hypothesis	Result
H1	The “Financial Risk” of consumers when using LINE, it will have a positive impact on “Perceived Risk”.	Accept
H2	The “Performance risk” of consumers when using LINE, it will have a positive impact on “Perceived Risk”.	Reject
H3	The “Physical risk” of consumers when using LINE, it will have a positive impact on “Perceived Risk”.	Reject
H4	The “Psychological risk” of consumers when using LINE, it will have a positive impact on “Perceived Risk”.	Accept
H5	The “Social risk” of consumers when using LINE, it will have a positive impact on “Perceived Risk”.	Reject
H6	The “Time risk” of consumers when using LINE, it will have a positive impact on “Perceived Risk”.	Accept
H7	The “Perceived Risk” of consumers when using LINE, it will have a negative impact on “Willingness to Use”.	Accept
H8	The “Telecommunication frauds experience” of consumers when using LINE, it will have a negative impact on “Willingness to Use”.	Accept

Chapter 5 Conclusions and Suggestions

Based on the results from previous chapter, this chapter proposes conclusions and contributions of this study, and provides potential research questions for LINE.

Besides, it also explains the limitations of this study and the direction for future research. There are three subsections in this chapter. The first section is research conclusion, the second section is research contribution, and the last section is research limitations and suggestions for future research.

5.1 Research conclusions

This study attempts to combine six potential independent variables, which are financial risk, performance risk, physical risk, psychological risk, social risk and time risk in the perceived risk theory, with telecommunication frauds experience as moderator, to jointly explore users' potential behavior on instant messaging software LINE, to understand how LINE can quickly become the most popular instant messaging software in Taiwan.

In other words, this study is based on the proposed integration model, constructing the relationship model of consumers' willingness to use instant messaging software LINE, and further analyzing the important factors and interaction effects of consumers' willingness to use instant messaging software LINE.

This study empirically found that financial risk, psychological risk and time risk

have a significantly positive impact on perceived risk, while the path coefficients are 0.323, 0.388, and 0.113, respectively. Psychological risk has the greatest impact, followed by financial risk.

Performance risk, physical risk and social risk do not significantly affect perceived risk. The path coefficients are -.069, 0.018, and 0.035, respectively.

In addition, the perceived risk and telecommunication frauds experience negatively affect the willingness to use. The path coefficients respectively are -0.094 and -0.127, and the telecommunication frauds experience does have a significant interference effect on consumers' willingness to use.

The structure of this research has been proved to be a good explanation for the willingness to use LINE. There are as many as 86.3% of consumers have used LINE for more than three years, and 95.6% of the respondents claim that they have to use LINE several times within a day, which means that LINE users have a high degree of loyalty.

Consequently, the results of this study are reliable. We conclude following conclusions by the analysis results from each research hypothesis.

(1) Psychological risk has the greatest positive impact on perceived risk.

The results of this study indicate that consumers' psychological risks, which cause a positive and very significant impact on perceived risk of using LINE. In other words, spam or advertisements on the instant messaging software LINE can annoy consumers, causing consumers to have doubts about privacy leakages, and ultimately

let consumers have negative views and pressure on the instant messaging software LINE.

(2) The positive impact of financial risk on perceived risk is second

The results of this study reveal that financial risk has a significantly positive influence on perceived risk of using LINE. It means that consumers in Taiwan pay more attention to personal financial protection, and particularly concerns about whether there will be an unauthorized charge or usurps during the transaction.

(3) Time risk has the least positive impact on perceived risk.

The results of the study show that consumers' time risk has a positive and significant impact on the perceived risk of using LINE. In other words, consumers will still care about how much time they spend in LINE. However, LINE provides a comprehensive mobile platform services, including games, shopping, communications, video, etc., so it can consume much more time for using LINE.

(4) Performance risk, physical risk and social risk have no significant relationship to perceived risk.

The results of this study report that consumers' performance risk, physical risk and social risk have no significant relationship to perceived risk. Especially in terms of performance, this study initially assumes that performance risk positively influences perceived risk, but the results of the questionnaire indicate that the two are negatively correlated. One possible explanation is that LINE's functionality and performance are so satisfying, so even if there are some risks in use, consumers will not give up using the instant messaging software LINE.

As for physical risk, the research results reveal that it has no significant relationship with perceived risk. One possible and reasonable explanation is that when consumers are using LINE, they usually do not use it for a long time, but use it multiple times a day. Therefore, unlike other entertainment products, which take consumers a long time to use, such as online games, and the descriptive statistics in the first section of Chapter 4 echo this result, with up to 95.6% of the subjects indicate that they use LINE several times a day.

On the aspect of social risks, the research results show that there is no significant relationship with perceived risk. One possible and reasonable explanation is that consumers use LINE to communicate with people. As a result, in the case of everyone using this software, it will naturally reduce the risk of others being treated differently. This explanation also confirms the content in literature review that up to 90% of Taiwanese have the habit of using LINE.

(5) Telecommunication frauds experience has the greatest negative impact on willingness to use.

The results of this study report that consumers' telecommunication frauds experience has a negative and very significant impact on the willingness to use LINE, with interference effects. In other words, if consumers receive too many frauds on LINE, or have experienced losses caused by fraud, it will affect consumers' willingness to use LINE, which is one of the key points that this study emphasizes.

(6) The negative impact of perceived risk on the willingness to use is second

The results of this study indicate that consumers' perceived risk has a negative and significant impact on the willingness to use LINE. This also means that in terms

of overall perceived risk, Taiwanese consumers still attach great importance to the risk of using LINE, especially in these three particularly significant aspects: financial risk, psychological risk and time risk. In the next section, this study will address these three aspects and make appropriate management recommendations for companies.

5.2 Management implications

Based on the above research conclusions, we can understand the impact of perceived risk on consumers' willingness to use instant messaging software LINE, and verify that telecommunication frauds experience is a significant disruptive factor for consumers' willingness to use LINE. Hence, based on the analysis results, this study proposes the following four management practices suggestions for the service providers in related fields or related applications.

(1) Pay attention to telecommunication frauds to avoid negative perception of brands

In the era of information explosion and rapid development of Internet technology, telecommunication fraud crimes are easily lurking in various types of communication software. If consumers do not understand the relevant security mechanisms and privacy policies, they may suffer from telecommunication frauds and the loss in follow.

Therefore, we recommend social media industry players should use relevant technologies to enhance the security and confidentiality of software, and to remind consumers of protection functions in a timely manner. In this part, social media service providers shall develop relevant procedures as the 1st step and make sure

consumers clearly understand the relevant remedies.

For example, to build a customer service online system that is convenient and easy for consumers to process. Once there are doubts about telecommunication frauds, consumers will have a pipeline to settle the problems in real time. Only let the brand become the most loyal supporter of consumers, consumers can use the brand's instant messaging service in a way that is both peaceful and trustworthy.

(2) Improve security protection to reduce consumer's psychological risk

It can be verified from the research model of this study that the psychological risk is indeed an important factor in the user's behavior of using LINE, and it has a direct positive impact on the user's perceived risk.

Consequently, it is recommended that related companies, while introducing new ideas and functions, also pay attention to the protection of privacy information and system security, and often update the database and algorithms to prevent the fake accounts and spam on the platform. In addition, relevant operators should also fulfill their responsibility for educating the public about the correct concept of security.

For most community service users, the main reason for telecommunication fraud is that the password or security authentication code is known by others. Therefore, users must understand that password and security authentication code are important for privacy protection while enjoying the convenience of community services. They should replace passwords more often to improve the security of personal community accounts. When receiving an unknown link sent by a stranger via LINE, the user must first confirm the source and content of the link. Do not click on the suspicious link, so

as not to be deceived by wrongdoers, resulting in the leakage of important personal information.

Only through the cooperative efforts of enterprises and users can we ensure the security of the platform. Thereby effectively reducing the overall psychological risk of the user, enabling the company to operate sustainably in an environment full of security threats.

(3) Deep integration with bankers to reduce financial risk

It can be verified from this study that the financial risk is an important factor influencing user's behavior of using LINE, and it cause a direct positive impact on the user's perceived risk.

In view of the rise of electronic payment and mobile commerce, it is recommended that LINE can use LINE Pay's services to integrate deeply with card issuers. Bankers are responsible for planning virtual financial butler's instant services, pushing and transmitting daily e-bills and account status through LINE, so that users can open their LINE to control their financial status.

If the account has stolen or abnormal transfer, users can be notified through LINE at first, then they can report the loss through LINE and process the subsequence of the dispute. Companies can turn a possible risk crisis into an opportunity to serve consumers.

(4) Pay attention to the importance of time risk

Time risk is verified to be an important factor in affecting user's behavior of using LINE, and it has a direct positive impact on user's perceived risk.

Hence, relevant operators should focus on optimizing the software execution process, when designing the program interface, to provide a better user experience to consumers in order to meet the needs of most consumers. Only a good user experience can improve their willingness to use and have opportunity to be chosen as a preferred instant messaging software in social activities.

Furthermore, there are many companies nowadays, and they are used to regard LINE as a communication bridge between departments and employees. Therefore, this study suggests that LINE can develop enterprise-specific communication channels that enterprises and employees can use during business hours. On the one hand, it can design application services that are more suitable for business to speed up the communication and execution efficiency, on the other hand, it can also prevent employees from receiving the job information during non-working hours, which gives them time pressure and psychological burden then makes the employees to evade using LINE eventually.

5.3 Research limitations and suggestions for future research

Although this study is based on relevant theories to derive the research structure, and develop the questionnaire with reference to the relevant literature, it is still affected by some external factors in the process of analysis. Consequently, some limitations and suggestions for future research are organized as follows.

(1) The sample distribution in the questionnaire

In this study, the respondents were surveyed in the form of an online questionnaire. Therefore, the subjects are mostly students aging 21 to 30 with monthly disposable income below 10,000 NTD, which does not include the overall consumer groups in reality.

Therefore, in future research, this study suggests that paper questionnaires can be used to reach consumers of different ages, in order to avoid the concentration of samples in a certain age group, a certain occupation and other problems like place of residence.

(2) Differences in the subjective consciousness of the subject

The literature review mentions that the willingness to use is the most important mediator variable to predict the actual behavior of consumers. Hence, consumers' subjective judgments on LINE may be different due to personal factors, values, and life background. This study suggests that future research may add personal traits or environmental factors as interference variables to increase research richness.

(3) Type differences between APPs

This study uses LINE as the research object, and mainly base on the experience of Taiwanese consumers, so it has not been verified whether it can be pushed to other types of APPs. The research results may change due to the type differences between APPs. Therefore, this study suggests that other different types of APPs can be explored in the future, to study whether consumers have different views on the willingness to use different types of APPs.

(4) Synergistic effects brought by different research methods

This study mainly adopts questionnaire to verify the hypothesis in this study. If it can be supplemented by in-depth case interviews and company interviews, and quantitative and qualitative research at the same time, there may be deeper integration between reality and research results. This helps the research results to be adopted by companies, governments, and academia.

(5) Time consideration for research design

The research design of this study is a cross-sectional approach. Data collection is only performed at fixed time points. If you need a more comprehensive understanding of the relationship between various research variables in the analysis mode, the collected profile data can be enhanced, according to the year or month, to find out whether the company is actively improving the product for the market and consumers, and whether the consumer's preference for the product will change over time.

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Formal Questionnaire (Appendix)

親愛的先生/女士您好：

非常感謝您抽空填寫本問卷，此研究目的是為了解您對即時通訊軟體 LINE 的使用意願之看法，因此十分希望您能提供寶貴的意見。

本問卷採用匿名方式，僅用於學術用途，不會轉用其他用途、更不會洩漏您的私人資料，請您安心填答。

再次感謝您的熱心參與！

敬祝順心、愉快！

國立成功大學電信管理研究所

指導教授：黃光渠 博士

研 究 生：余偉碩 敬上

【第一部分】

1. 請問您是否有使用過即時通訊軟體 LINE 的經驗？ ☐是 ☐否（回答「否」者，問卷到此結束）
2. 請問您是否有在即時通訊軟體 LINE 上購買商品的經驗(包含用 LINE 點數換購貼圖、在 LINE 口袋商店購買商品等等)? ☐是 ☐否

【第二部分】

請填寫您使用即時通訊軟體 LINE 的日常習慣，並在適當的 ☐ 中勾選。

1. 使用即時通訊軟體 LINE 之時間歷程？

☐半年以下 ☐半年~一年 ☐一年~兩年 ☐兩年~三年 ☐三年以上

2. 使用即時通訊軟體 LINE 之頻率？

☐一日數次 ☐一日一次 ☐數日一次 ☐一個月一次 ☐數個月一次

3. 每日花費多少時間在使用即時通訊軟體 LINE ？

☐一小時以下 ☐一小時~兩小時 ☐兩小時~三小時 ☐三小時以上

【第三部分】

請填寫您的個人基本資料，並在適當的□中勾選。

1. 請問您的性別？
<input type="checkbox"/> 男 <input type="checkbox"/> 女
2. 請問您的年齡為何？
<input type="checkbox"/> 20 歲以下 <input type="checkbox"/> 21~30 歲 <input type="checkbox"/> 31~40 歲 <input type="checkbox"/> 41~50 歲 <input type="checkbox"/> 51~60 歲 <input type="checkbox"/> 60 歲以上
3. 請問您的教育程度為？
<input type="checkbox"/> 小學以下 <input type="checkbox"/> 國(初)中 <input type="checkbox"/> 高中(職) <input type="checkbox"/> 大專院校 <input type="checkbox"/> 研究所以上
4. 請問您的個人每月可支配所得為多少？
<input type="checkbox"/> 10,000 元以下 <input type="checkbox"/> 10,001~20,000 元 <input type="checkbox"/> 20,001~30,000 元 <input type="checkbox"/> 30,001~40,000 元 <input type="checkbox"/> 40,001~50,000 元 <input type="checkbox"/> 50,001 元以上
5. 請問您目前所從事的行業類別為？
<input type="checkbox"/> 學生 <input type="checkbox"/> 農、林、漁、牧業 <input type="checkbox"/> 製造業 <input type="checkbox"/> 商/金融業 <input type="checkbox"/> 餐飲業 <input type="checkbox"/> 服務業 <input type="checkbox"/> 醫療業 <input type="checkbox"/> 家管 <input type="checkbox"/> 軍公教人員 <input type="checkbox"/> 大眾傳播業 <input type="checkbox"/> 退休或待業中 <input type="checkbox"/> 其他 _____
6. 請問您目前的居住地為何？
<input type="checkbox"/> 台北市 <input type="checkbox"/> 新北市 <input type="checkbox"/> 基隆市 <input type="checkbox"/> 桃園市 <input type="checkbox"/> 新竹市/縣 <input type="checkbox"/> 苗栗縣 <input type="checkbox"/> 彰化市/縣 <input type="checkbox"/> 台中市 <input type="checkbox"/> 南投市/縣 <input type="checkbox"/> 雲林縣 <input type="checkbox"/> 嘉義市/縣 <input type="checkbox"/> 台南市 <input type="checkbox"/> 高雄市 <input type="checkbox"/> 屏東市/縣 <input type="checkbox"/> 花蓮市/縣 <input type="checkbox"/> 台東市/縣 <input type="checkbox"/> 宜蘭市/縣 <input type="checkbox"/> 離島地區 <input type="checkbox"/> 其他 _____

【第四部分】

請您依據目前使用即時通訊軟體 LINE 之實際經驗，在適當的 ☐ 中勾選。

	非常不同意	不同意	普通	同意	非常同意
財務風險					
1. 我會擔心透過 LINE 進行交易行為後，發現該項商品並非物有所值。	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. 我會擔心透過 LINE 進行交易行為後，付了錢卻沒收到物品，因此遭受金錢損失。	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. 我會擔心透過 LINE 進行交易行為後，信用卡資料被盜刷進而造成財務損失。	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. 我會擔心透過 LINE 進行交易行為後，個人身分資料被盜用進而造成財務損失。	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
績效風險					
1. 我會擔心透過 LINE STORE 或者 LINE 口袋商店購買貼圖或商品後，發現該商品在使用上根本不符合當初所預期。	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. 我會擔心透過 LINE STORE 或者 LINE 口袋商店購買貼圖或商品後，發現該商品功能無法滿足我的需求。	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. 我會擔心 LINE 的視訊及通話的效果，無法滿足我對於通訊品質的要求。	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. 我會擔心 LINE 對於檔案的傳輸限制或者相容性問題，無法滿足我對於通訊的需求。	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	非常不同意	不同意	普通	同意	非常同意
身體風險					
1. 我會擔心長時間使用 LINE 的服務後，發現眼睛以及四肢肌肉酸痛等生理不適現象。	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. 我會擔心長時間使用 LINE 的服務後，導致睡眠品質不佳以及頭腦昏沉等生理不適現象。	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. 我會擔心長時間使用 LINE 的服務後，影響到日常的生活作息與飲食。	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. 我會擔心長時間使用 LINE 的服務後，誘發 3C 產品之相關網路成癮症。	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
心理風險					
1. 我會擔心使用 LINE 的服務後，對於過度的垃圾廣告訊息通知產生焦慮及不安的負面情緒。	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. 我會擔心使用 LINE 的服務後，對於過度的工作通知以及親友訊息產生焦慮及不安的負面情緒。	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. 我會擔心使用 LINE 的服務後，會有隱私洩漏的疑慮，包括影片、照片和文字內容等。	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. 我會擔心使用 LINE 的服務後，會有隱私洩漏的疑慮，包括個人資料和交易資料等。	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	非常不同意	不同意	普通	同意	非常同意
社會風險					
1. 我會擔心透過 LINE 進行交易行為後，發現該商品或服務不被家人或朋友認同。	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. 我會擔心過度使用 LINE 的服務後，讓家人或朋友對自己產生負面的觀感。	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. 我會擔心使用 LINE 的服務會導致個人身分資料被盜用，進而對家人或朋友帶來詐欺的威脅。	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. 我會擔心使用 LINE 的服務會導致個人身體健康的危害，進而對家人或朋友帶來生活上的負擔。	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
時間風險					
1. 我會擔心花費過多時間，在即時通訊軟體 LINE 上尋找或瀏覽喜愛的商品。	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. 我會擔心花費過多時間，在即時通訊軟體 LINE 上進行交談或聊天的行為。	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. 我會擔心花費過多時間，在即時通訊軟體 LINE 上進行手機遊戲或觀賞影音娛樂的行為。	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. 我會擔心花費過多時間，在即時通訊軟體 LINE 上進行觀看新聞或廣告的行為。	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	非常不同意	不同意	普通	同意	非常同意
知覺風險					
1. 綜合來說，我覺得使用即時通訊軟體 LINE 對於個人隱私是存在風險的。	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. 綜合來說，我覺得透過即時通訊軟體 LINE 來進行交易行為是存在風險的。	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. 綜合來說，我覺得過度使用即時通訊軟體 LINE 對於身心健康是存在風險的。	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. 綜合來說，我覺得過度使用即時通訊軟體 LINE 對於時間的浪費是存在風險的。	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
電信詐欺經驗					
1. 我曾經在即時通訊軟體 LINE 上，接收過未知帳號所提供的不明連結訊息。	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. 我曾經在即時通訊軟體 LINE 上，接收過假冒親朋好友的帳號所傳送之各項訊息。	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. 我曾經在即時通訊軟體 LINE 上，接收過未知帳號所提供之有違常理的商品優惠廣告訊息。	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. 我曾經在即時通訊軟體 LINE 上，接收過假冒知名品牌的官方帳號所傳送之各項訊息。	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	非常不同意	不同意	普通	同意	非常同意
使用意願					
1. 未來，我仍然會經常使用即時通訊軟體 LINE。	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. 未來，我對於使用即時通訊軟體 LINE 抱持正面的看法。	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. 相較於其他即時通訊軟體，我傾向繼續使用即時通訊軟體 LINE。	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. 綜合來說，我對於使用即時通訊軟體 LINE 的各項服務之意願是高的。	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

本問卷結束，非常感謝您的填答！祝您事事順心，愉快！