# Attitude, Behavioral Intention and Usage: An Empirical Study of Taiwan Railway's Internet Ticketing System

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## ABSTRACT

*The Internet has become an essential part of business due to its rapid growth. Many businesses circulate information and interact with potential customers through the Internet, while some also trade with customers on their websites. Furthermore, many studies have observed that a website is an essential component of business, and websites are becoming increasingly important. Based on TAM (Davis,1986), this study discusses customer behavior when using Taiwan Railway's Internet Ticketing System. Hee-dong and Youngjin (2004) have observed that "...attitude deserves more attention in IS research due to its considerable influence on individual and organizational usage of IS.", and discovered that a better understanding of the role of attitude can enhance explanatory power of the model. Cheng, Lam, and Yeung (2006) also observed that web security is an important variable in the TAM model. This study discusses the relationships among web security, attitude, and behavioral intention. Davis et al.'s technology model (TAM) is used with attitude toward IS usage described in terms of both the affective and cognitive dimensions.*

## INTRODUCTION

The theory of reasoned action, TRA (Ajzen *et al.*, 1975) measures the ability to predict people's computer acceptance from measuring the effect of perceived and other affective variables. The technology acceptance model, TAM (Davis, 1986), is based on TRA. However, some researchers consider that TAM could be expanded as a complete model.

Cheng *et al.* (2006) concluded that web security has a positive influence on attitude and behavioral intention. Therefore, this study sets web security as an important variable. Besides, perceived ease of use and perceived usefulness, which are the two important considerations affecting the usage of information systems. Some investigations on social psychology have

concluded that attitude can be measured in terms of both affective and cognitive dimensions. Hee-dong *et al.* (2004) expanded the TAM model with affective attitude and cognitive attitude as the alternatives to attitude. There, this case study combines these two factors into the TAM model.

Individuals are increasingly ordering tickets on line. The online ticket in North America had a value of US$5,400 million in 2004, according to a research report by Ching-Hong Li from the Institute for Information Industry in Taiwan, based on Forrester's research reports. Online ticket sales will continue rising in the next five years, totaling US$9,400 million U.S. dollars in 2010, according to Forrester's forecast. Over one-third of online shoppers bought tickets on line in 2004. Furthermore, these online tickets shoppers bought most show and sport tickets. Accordingly, this study has the following four objectives:

(1) to present the results of an empirical study of customer attitudes to Taiwan Railway's Internet Ticketing System;
(2) to summarize customer attitudes toward behavioral intention and usage in Taiwan Railway's Internet Ticketing System, and
(3) to report the effect of web security toward attitude and behavioral intention.

## OVERVIEW OF THE FRAMEWORK

Hee-dong *et al.* (2004) developed a conceptual model of both the affective and cognitive dimensions of attitude toward IS usage. Their model was based on the original TAM model (Davis *et al.*, 1989), with the addition of behavioral intention back as a mediator between attitude and usage.

Cheng *et al.* (2006) extended the TAM model to include perceived web security as a predictor of attitude and intention to use.

This study develops a theoretical model including both the concepts included in the above two works. Figure 1 graphically displays the proposed theoretical model.
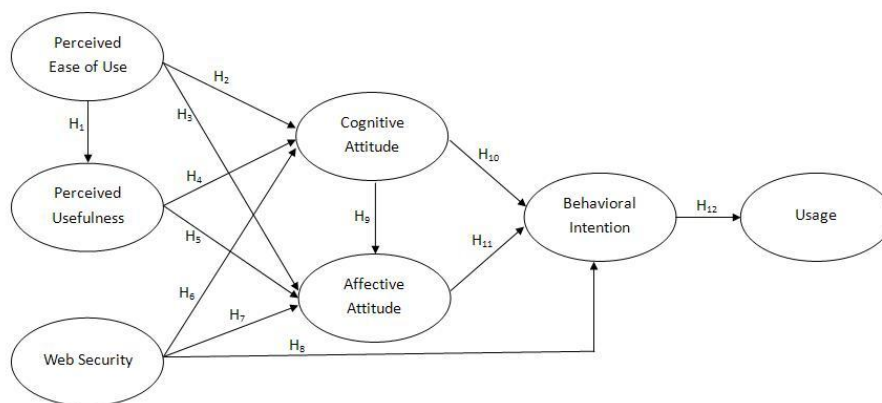


*Figure 1*. Conceptual framework

Perceived ease of use exerts a positive effect on perceived usefulness. An empirical test for the original TAM model has found that perceived ease of use has a positive influence on perceived usefulness. The conceptual model of Hee-dong *et al.* (2004) and the theoretical

model of Walczuch, Lemmink and Streukens (2007) indicate that users perform well in tasks when they do not need to expend much effort. Therefore, hypothesis $H_1$ is proposed as follows:

$H_1$: Perceived ease of use positively influences perceived usefulness.

Attitude is an essential factor in explaining human behavior. How to measure attitude is also an interesting issues. Several social psychology studies have concluded that attitude has both affective and cognitive components (Hee-Dong *et al.*, 2004). Petty *et al.* (1998) stated, "*The most common classification for the basis of attitude is affect and cognition.*" Therefore, according to Hee-dong *et al.* (2004), "*The dyadic view presumes the affective and cognitive to be independent variables that affect behavioral intention.*" Namely, the conceptual model of Hee-dong *et al.* (2004) indicates that both perceived ease of use and perceived usefulness may affect cognitive and affective attitude, leading to the following hypotheses:

$H_2$: Perceived ease of use positively influences cognitive attitude.
$H_3$: Perceived ease of use positively influences affective attitude.
$H_4$: Perceived usefulness positively influences cognitive attitude.
$H_5$: Perceived usefulness positively influences affective attitude.

Cheng *et al.* (2006) concluded that web security directly influences attitude and behavioral intention. Thus, using cognitive and affective attitude to measure attitude leads to the following hypotheses:

$H_6$: Web security positively influences cognitive attitude.
$H_7$: Web security positively influences affective attitude.
$H_8$: Web security positively influences behavioral intention.

Cognitive attitude also exerts a positive impact on affective attitude. The empirical test of Hee-Dong *et al.* (2004)'s found support for a positive influence of cognitive attitude on affective attitude. Hence:

$H_9$: Cognitive attitude positively influences affective attitude.

Attitude may also have an effect beyond a direct impact on intention. The original TAM model (Davis, 1986), and the models of Taylor & Todd (1995) and Morris & Dillon (1997) indicate that attitude exerts a positive effect on behavioral intention. The associated hypotheses are:

$H_{10}$: Cognitive attitude positively influences behavioral intention toward usage.
$H_{11}$: Affective attitude positively influences behavioral intention toward usage.

Finally, since this study is exploring the intentions of using the information technology system, the condition of actual usage is also of interest. The original TAM model (Davis, 1986) indicates that behavioral intention exerts a positive effect on usage. Bagozzi *et al.* (1992), Szajna (1996) and Morris *et al.* (1997) found that behavioral intention might influence usage. These observations lead to the following hypothesis:

$H_{12}$: Behavioral intention positively influences usage.

# METHODOLOGY

## *Study object and sample*

This study observed the effect of attitude on behavioral intentions of the technology acceptance model of an information system, based on an internet ticketing system for public transportation in Taiwan. The railway network in Taiwan was built from 1887, and developed from steam, diesel and modern electric trains. At the end of 2007, Taiwan Railway had more than 13,000 employees, and an average of about 465,000 passengers per day. The passenger ratio per train was about 60% in 2007. Taiwan Railway handles freight as well as passenger transport as well. The sample system, Taiwan Railway's internet ticketing system, was introduced in 1997, with an English-language version being launched in 1998. The system offers Internet ticketing service, including booking tickets, canceling tickets and looking up for the available tickets.

According to Hee-dong *et al.* (2004), attitude is an important factor in IS research, since it significantly influences individual and organizational usage of IS. Cheng *et al.* (2006) concluded that web security should be incorporated into the TAM model. This study explores how both attitude and web security affect TAM. To explore thoroughly the heterogeneous characteristics of TAM, data for the present study were collected from Internet and street surveys. In total, 305 surveys were collected from June 2008 to July 2008. The final sample of valid questionnaires, after discarding the uncompleted questionnaires, was 296. To avoid demand effect, the respondents were guaranteed that all answers would be anonymous. Table 1 presents the descriptive statistics analysis of sample size.

Table 1
Descriptive Statistics Analysis of Sample Size

| Respondents' characteristics | N=296 |
|---|---|
| *Gender* | |
| Male | 33.4% |
| Female | 66.6% |
| | |
| *Age* | |
| $\leqq 20$ | 7.40% |
| $21-30$ | 55.7% |
| 31 - 40 | 24.3% |
| $41-50$ | 8.10% |
| $\geqq 51$ | 4.40% |
| | |
| *Education* | |
| $\leqq$ High school diploma | 0.70% |
| Senior high school | 13.5% |
| College | 15.9% |
| University | 39.2% |
| $\geqq$ Graduate school | 30.7% |
| | |
| *Occupation* | |
| Information | 2.70% |
| Electronic | 2.70% |
| Service | 35.1% |
| Manufacture | 1.00% |
| Travel | 1.40% |

| Mass communication | 2.00% |
| Student | 33.8% |
| Other | 21.3% |

**Per Capita Disposable Income/month**

| | |
|---|---|
| ≦15,000 | 33.8% |
| 15,000~35,000 | 35.5% |
| 35,000~55,000 | 19.6% |
| 55,000~75,000 | 6.80% |
| 75,000~100,000 | 1.70% |
| ≧100,000 | 2.70% |

**Internet experience**

| | |
|---|---|
| ≦3 years | 8.10% |
| 3 - 6 years | 24.0% |
| 6 - 9 years | 29.1% |
| ≧9 years | 38.9% |

## Development of Measures

Tables 2 and 3 list the items related to all variables. The measures of each construct are defined as follows.

Table 2

The Survey Instrument-- Exogenous constructs

| Items | Item-Construct Loading | | Cronbach's Alpha | Average Variance Extracted |
|---|---|---|---|---|
| | Standardized | t-statistic | | |
| **Perceived Ease of Use** | | | 0.937 | 0.83 |
| 1. Learning to operate Taiwan railway's internet ticketing system is easy for me | 0.89 | 19.34 | | |
| 2. I find it easy to get Taiwan railway's internet ticketing system to order tickets | 0.90 | 19.70 | | |
| 3. It would be easy for me to become skillful at using Taiwan railway's internet ticketing system | 0.92 | 20.56 | | |
| 4. I would find Taiwan railway's internet ticketing system easy to use | 0.92 | 20.54 | | |
| **Web Security** | | | 0.940 | 0.87 |
| 1. I feel secure sending personal/ financial info across the Web | 0.96 | 22.01 | | |
| 2. I feel safe providing personal/ financial info about me to Taiwan railway's internet | 0.96 | 21.14 | | |

ticketing system

3.  Web is safe environment to provide personal/ financial info          0.90          19.96

Table 3

The Survey Instrument-- Endogenous constructs

| Items | Item-Construct Loading | | Cronbach's Alpha | Average Variance Extracted |
|---|---|---|---|---|
| | Standardized | t-statistic | | |
| *Perceived Usefulness* | | | 0.903 | 0.75 |
| 1.  Using Taiwan railway's internet ticketing system would increase the convenience of internet ticketing | 0.84 | -- | | |
| 2.  Using Taiwan railway's internet ticketing system would improve the efficiency of internet ticketing | 0.90 | 20.30 | | |
| 3.  Using Taiwan railway's internet ticketing system would make me get the tickets faster | 0.83 | 17.60 | | |
| 4.  I would find Taiwan railway's internet ticketing system useful for internet ticketing | 0.88 | 19.58 | | |
| *Cognitive Attitude* | | | 0.937 | 0.82 |
| 1.  Taiwan railway's internet ticketing system is a wise instrument for ordering ticket over the internet | 0.86 | -- | | |
| 2.  Taiwan railway's internet ticketing system is a beneficial instrument for ordering ticket over the internet | 0.93 | 23.26 | | |
| 3.  Taiwan railway's internet ticketing system is a valuable instrument for ordering ticket over the internet | 0.92 | 22.56 | | |
| *Affective Attitude* | | | 0.880 | 0.79 |
| 1.  Using Taiwan railway's internet ticketing system makes me feel happy | 0.81 | -- | | |
| 2.  Using Taiwan railway's internet ticketing system makes me feel positive | 0.92 | 19.10 | | |
| 3.  Using Taiwan railway's internet ticketing system makes me feel good | 0.93 | 19.11 | | |
| *Behavioral Intention* | | | 0.719 | 0.35 |

75

| | | | |
|---|---|---|---|
| 1. I predict that I will use Taiwan railway's internet ticketing system on a regular basis in the future | 0.61 | -- | |
| 2. Although I will likely take public transport for a long way, I think that I may not take the train but have the alternatives of other transport in the future | -0.30 | -4.38 | |
| 3. I expect that I will use Taiwan railway's internet ticketing system, or a similar type of system for ordering tickets over the internet | 0.76 | 9.06 | |
| *Usage* | | 0.902 | 0.88 |
| 1. Frequency (per year) | 0.87 | -- | |
| 2. Accumulated used times | 1.04 | 31.84 | |
| 3. Accumulated dollars amount | 0.90 | 23.95 | |

Perceived ease of use: defined as the degree to which an individual believes that learning to adopt a technology requires little effort (Davis, 1989). Perceptions of whether the Taiwan Railway internet ticketing system was easy to use were captured using a questionnaire with four items scored using a 5-point Likert-type scale (1, *strongly disagree* to 5, *strongly agree*). The reliability of the four items in this questionnaire was 0.94, in the reasonable range.

Perceived usefulness: defined as an individual's perception that use of technology will improve performance (Davis, 1989). People's perception that Taiwan Railway's internet ticketing system was valuable were captured by a questionnaire with four items scored using a 5-point Likert-type scale (1, *strongly disagree* to 5, *strongly agree*). The reliability of the four items in this questionnaire was 0.90, in the reasonable range.

Web security: defined as the belief that the Web is secure for transmitting sensitive information (e.g. credit card or social security number) (Salisbury *et al.*, 2001). This factor was captured by a three-item questionnaire, again scored using 5-point Likert-type scale (1, *strongly disagree* to 5, *strongly agree*). The reliability of these three items was 0.94, in the reasonable range.

Cognitive attitude: defined as an individual's specific beliefs related to the object. This factor consists of the evaluation, judgment, reception and perception of the object of thought based on values (Hee-dong *et al.*, 2004). Again, a three-item questionnaire scored using a 5-point Likert-type scale (1, *strongly disagree* to 5, *strongly agree*) to assess cognitive attitudes towards using Taiwan Railway's internet ticketing system. The reliability of these three items was 0.94, in the reasonable range.

Affective attitude: this is defined as on the degree of emotional attraction toward an object (Hee-dong *et al.*, 2004). A three-item questionnaire scored using 5-point Likert-type scale (1, *strongly disagree* to 5, *strongly agree*) was applied to assess affective attitudes among participants towards using Taiwan Railway's internet ticketing system. The reliability

of these three items was 0.88, in the reasonable range.

Behavioral intention: this is a predictor of use (Venkatesh *et al.*, 2003; Thompson *et al.*, 2006). A three-item 5-point Likert-type scale questionnaire (1, *strongly disagree* to 5, *strongly agree*) was again used to assess people's behavioral intention towards using the internet ticketing system of Taiwan Railway. The reliability of these three items was 0.72, in the reasonable range.

Usage: this refers to actual behaviors of people using the Taiwan Railway internet ticketing system. The study incorporated three usage variables, namely frequency of use, total number of times used and total amount of money spent. Users were asked to indicate how often they used Taiwan Railway's internet ticketing system, how many times they had used Taiwan Railway's internet ticketing system, and how much money they had spent. The reliability of these three items was 0.90, in the reasonable range.

### *Data analysis method and examination*

First, in the data examination process we deleted cases incorporating missing values. Besides, with respect to sample size, it is generally accepted that the minimal sample size needed to ensure appropriate use of maximum likelihood estimation is 100-150 (Anderson and Gerbing, 1988). In the present study, we have used somehow a larger sample sizes given the risk of moderate normality violations. Finally, we tested for the existence of univariate and multivariate outliers, and no outliers were found in our analyses.

Based on Anderson and Gerbing (1988)'s study, our structural equation model could be test by a two-stage structural equation model. First, we use confirmatory factor analysis, CFA, to evaluate construct validity regarding convergent and discriminate validity. Then, the second is that using path analysis to test the research hypotheses empirically. The path-analytic procedure is becoming common in studies (Li and Calantone, 1998; Chaudhuri and Holbrook, 2001).

### *Overall model evaluation*

Table4 is the resulting values of the fit statistics. The $\chi^2$/df=4.16<5 is acceptable (Wheaton, 1987；Hair et al., 1998). Besides, the values for NFI=0.93, NNFI=0.94>0.9 are acceptably close to the standards suggested by Tucker and Lewis (1973) & Bentler and Bonnett (1980); RMSEA, root mean square error of approximation is 0.093<0.1 (Browne and Cudeck, 1993), and SRMR, standardized root mean residual is 0.05<0.1, are acceptable as well (Hu and Bentler, 1999). Given that our study performed overall goodness-of-fit indices were acceptable, our model was developed on theoretical bases. Thus, we can proceed in evaluating the measurement and structural models.

Table 4

Goodness of fit statistics

| Model/Construct | $\chi^2$/df | GFI | RMSEA | NFI | NNFI | SRMR | CFI |
|---|---|---|---|---|---|---|---|
| CFA | 4.16 | 0.82 | 0.093 | 0.93 | 0.94 | 0.05 | 0.95 |
| Suggested Values | <5 | >0.8 | <0.1 | >0.9 | >0.9 | <0.1 | >0.9 |

*Measurement model evaluation*

We assessed the quality and adequacy of our measurement models by investigating convergent validity, and reliability. First, convergent validity was supported as a result of the fact that the overall fit of the model was good, that all loadings were highly statistically significant (Hildebrandt, 1987; Steenkamp and van Trijp, 1991). Second, reliability was supported as a result of the fact that all Cronbach alpha's values exceeded 0.70, indicating acceptable reliability levels (Nunnally, 1978).

According to the result of Table3, almost all of the composite reliability measures are equal to or above 0.60, corresponding to Bagozzi and Yi (1988)'s minimum values of 0.60. Thus, we could conclude that all constructs yield satisfactory reliabilities. Therefore, these results have showed that the data is reasonably fit the model.

*Path model and hypothesis testing*

Table 5 presents the results of the research hypotheses of our structural equation model, after completing path analysis. Obviously, hypotheses $H_2$, $H_3$ and $H_8$ are not supported. Thus, perceived ease of use has no significance impact on cognitive attitude; perceived ease of use has no significance influence on affective attitude, and web security exerts no significant influence on behavioral intention.

Table 5
Empirical Results of the Proposed Model

| Causal Path | Hypothesis | Expected Sign | Path Coefficient | t-value | Assessment (p ≦ .05) |
|---|---|---|---|---|---|
| Perceived ease of use→ Perceived usefulness | $H_1$ | + | 0.74 | 12.45 | s. |
| Perceived ease of use→ Cognitive attitude | $H_2$ | + | 0.02 | 0.28 | n.s. |
| Perceived ease of use→ Affective attitude | $H_3$ | + | -0.08 | -1.02 | n.s. |
| Perceived usefulness→ Cognitive attitude | $H_4$ | + | 0.68 | 8.48 | s. |
| Perceived usefulness→ Affective attitude | $H_5$ | + | 0.19 | 2.01 | s. |
| Web security→ Cognitive attitude | $H_6$ | + | 0.12 | 2.56 | s. |
| Web security→ Affective attitude | $H_7$ | + | 0.13 | 2.51 | s. |
| Web security→ Behavioral intention | $H_8$ | + | 0.06 | 1.10 | n.s. |
| Cognitive attitude→ Affective attitude | $H_9$ | + | 6.92 | 6.92 | s. |
| Cognitive attitude→ Behavioral intention | $H_{10}$ | + | 0.69 | 7.12 | s |
| Affective attitude→ Behavioral intention | $H_{11}$ | + | 0.16 | 2.05 | s |
| Behavioral intention→ Usage | $H_{12}$ | + | 0.13 | 2.22 | s |

Note: $\chi^2_{(217)}$=967.67, p=0.00, RMSEA=0.098; GFI=0.8, AGFI=0.75; CFI=0.94; NFI=0.93; NNFI=0.93

**RESULTS AND DISCUSSION**

*Conclusions and Managerial Implications*

The objective of this case study was to explore the effect of web security and attitude on the different two dimensions on technology acceptance model. Figure 2 illustrates the results

of the hypothesized framework, indicating support for most of the hypotheses tested. Obviously, from these results, perceived ease of use has no significant impact on cognitive or affective attitude, while web security has no significant impact on behavioral intention.
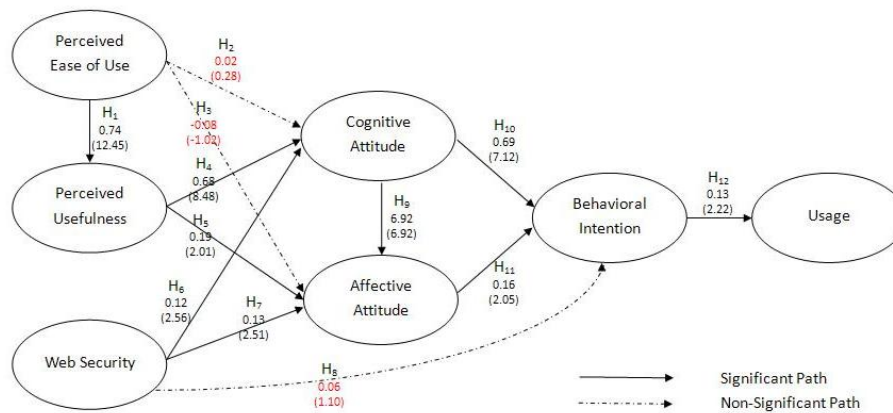


*Figure 2.* Results of hypothesized framework

The results of this case study demonstrate that both cognitive and affective attitude positive influence behavioral intention, and that behavioral intention positively influences usage. This finding is obviously different from that of Hee-dong *et al.* (2004), who concluded that "*affective attitude does not mediate the relationship between cognitive attitude and IS use.*" However, in this case study, the beta coefficient from cognitive attitude to behavioral intention toward usage was more than four times the value of the beta coefficient from affective attitude to behavioral intention toward usage. Thus, this case study disagrees with with Hee-dong *et al.* (2004), who found that, "*The cognitive dimension of attitude played an important role in explaining IS use.*"

Our analytical results also demonstrate that web security exerts a positive effect on cognitive and affective attitude, but no significance effect on behavioral intention. Obviously, this finding reveals that attitude is an important factor in behavioral intention toward usage. For "*Both the TAM and TRA models postulate that attitude is determined by one's relevant beliefs ...*" (Cheng *et al.*, 2006), this study finds that web security is an important variable related to belief. However, this finding is inconsistent with that of Cheng *et al.* (2006)'s study. The Cheng *et al.* (2006) the conceptual model, incorporating web security into TAM, had a positive effect on behavior, but no significant effect on attitude.

Thus, this study provides support for TAM, and confirms the hypothesis that the cognitive attitude is more powerful than affective attitude in explaining the behavioral intension toward usage. Besides, our study confirmed Hee-dong et al.'s (2004) argument about the finding of Davis et al. (1989) that attitude contribute little value toward the usage of information system for using the mixed measure of the attitude construct.

The following recommendations for the Taiwan Railway Administration can be made from this study. Our results suggest that attitude influences people's intention toward information usage. Thus, improving cognitive attitudes of users would improve people's intention to use information usage. The results of this study demonstrate that improving perceived usefulness and web security would directly improve user attitudes, and that

perceived ease of use indirectly affects attitude via perceived usefulness.

## *Limitations and recommendations for further research*

This empirical study was performed with a time constraint, making a large sample difficult to obtain. Like any cross-sectional studies, this study has limitations. This cross-sectional study was conducted in Taiwan, and might be difficult to generalize in a rapid changing world. Addition, more than half of the respondents of this questionnaire had no experience in using Taiwan Railway's internet ticketing system. Accordingly, the further studies could be performed to enlarge the sampling size. Finally, some the research time period may have been a factor affecting user acceptance of the information system (Karahanna *et al.*, 1999). Therefore, we recommend the further studies involve a long time period.

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