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Predicting the Use of Pirated Software: A Contingency Model Integrating Perceived Risk with the Theory of Planned Behavior

Chechen Liao
Hong-Nan Lin
Yu-Ping Liu

ABSTRACT. As software piracy continues to be a threat to the growth of national and global economies, understanding why people continue to use pirated software and learning how to discourage the use of pirated software are urgent and important issues. In addition to applying the theory of planned behavior (TPB) perspective to capture behavioral intention to use pirated software, this paper considers perceived risk as a salient belief influencing attitude and intention toward using pirated software. Four perceived risk components related to the use of pirated software (performance, social, prosecution and psychological risks) have been identified, measured and tested. Data were collected through an online survey of 305 participants. The results indicate that perceived prosecution risk has an impact on intention to use pirated software, and perceived psychological risk is a strong predictor of attitude toward using pirated software. In addition, attitude and perceived behavior control contribute significantly to the intended use of pirated software. However, the proposed direct relationship between subjective norm and intention to use pirated software is not supported. Implications for research and practice are discussed.

KEY WORDS: perceived risk, software piracy, theory of planned behavior

Introduction

Despite the fact that pirated software on personal computers (PC) declined in many countries in 2007, the Business Software Alliance (BSA) (2008) claimed that piracy in emerging, fast-growing PC markets caused overall numbers to worsen and dollar losses from piracy to rise to $48 billion. BSA emphasized that ''software piracy negatively affects much more than just the industry. It also puts a strain on technology companies' ability to invest in new jobs and new technologies; harms local retailers and services firms; lowers government tax revenues; and increases the risk of cyber crime and security problems.'' Software piracy, therefore, continues to be a major challenge for economies throughout the world. Understanding why people engage in piracy behaviors is an increasingly important issue for management and practice. Accordingly, this study aims to develop and empirically test a model examining the antecedents of attitude and behavioral intention that cause individuals to engage in the use of pirated software.

The proposed model of pirated software use draws from the theory of planned behavior (TPB), which has been extensively validated and successfully applied in a variety of instances of human behavior. TPB postulates that intention, which determines behavior, is a result of the person's attitude, subjective norm and perceived behavioral control over the target behavior. Attitude, subjective norm and perceived behavioral control are influenced by the beliefs a person holds. The necessity to examine the applicability of the TPB in the context of pirated software use is based on the following reasons.

First, in spite of the fact that TPB has been found to be very useful in predicting a wide range of behavior, it has rarely been applied to the study of software piracy (Chang, 1998). Moreover, while most software piracy studies focus on the purchase behavior of pirated software, there is a strong interest regarding behavior and intentions to actually use pirated software. Since pirated software can be distributed through various methods and channels, the number of users can be expected to be far larger

than those that purchase the pirated software. In fact, a large number of users acquire pirated software that is almost free (e.g., download from the Internet or borrow and copy it from others). It is, therefore, more significant to investigate the use behavior rather than purchase behavior in regards to pirated software.

Second, Ajzen (1991) emphasized that the relative importance of attitude, subjective norm and perceived behavioral control in the prediction of intention will vary with different behaviors and situations. For example, although some piracy studies (e.g., Kwong and Lee, 2002; Lin et al., 1999; Peace et al., 2003) showed that the subjective norm was a significant predictor of behavioral intention, others (e.g., Chang, 1998; Cronan and Al-Rafee, 2008) found that the direct effect of subjective norm on behavioral intention was not significant. Accordingly, we attempt to examine the relative importance of attitude, subjective norm and perceived behavioral control in the prediction of intention to use pirated software.

Finally, most piracy studies have focused on student populations (e.g., Chang, 1998; Cronan and Al-Rafee, 2008; Kwong and Lee, 2002), which may limit the generalizability of study results. This study empirically tests the applicability of TPB using a more generalized sample beyond students.

Past research identified risk as a critical factor influencing consumer decisions and behavior (e.g., Featherman and Pavlou, 2003; Fraedrich and Ferrell, 1992; Jacoby and Kaplan, 1972; Mitchell, 1992; Pavlou, 2003). Perceived risk is commonly thought of as a feeling of uncertainty regarding possible negative consequences (Featherman and Pavlou, 2003). Perceived risk increases with higher levels of uncertainty and/or the chance of greater associated negative consequences (Campbell and Goodstein, 2001). The use of pirated software involves risk because it may cause some consequences that users cannot expect. For example, the pirated software may fail to work like the original and even contain viruses to damage users' computer systems. Users are also likely to be caught because of infringement of copyright law. It can be expected that the more risk users perceive, the less likely they will be to use the pirated software. TPB posits that behavior is a function of salient beliefs relevant to the behavior. This study identifies perceived risk as a salient belief influencing the use of pirated software.

While perceived risk is usually measured as a multi-dimensional construct (Lim, 2003; Lin, 2008; Mitchell, 2001), few attempts have been made to identify key risk dimensions that influence one's decisions to use pirated software and examine to what extent those risk dimensions contribute to the decisions. While some types of risk dimensions have been identified to explain the purchase decisions of pirated software, the dominant risk dimensions and their relative importance might vary across research contexts. For example, financial, performance, prosecution and social risks have been shown as significant predictors of intention to purchase pirated software (Tan, 2002). However, financial risk is not applicable in the context of pirated software use, and psychological risk is an additional risk component that needs to be considered. Therefore, it is useful to examine which risk factors are most important in the specific case of pirated software use.

In short, this study attempts to provide a theoretical model that predicts behavior toward the use of pirated software. The principal objectives are to:

- Evaluate the applicability of TPB to predict behavior toward the use of pirated software.
- Identify the perceived risk dimensions related to the use of pirated software and examine their relationships to the person's attitude and intention toward using pirated software.

Theoretical background

Theory of reasoned action and theory of planned behavior

Drawn from social psychology, Fishbein and Ajzen's (1975) theory of reasoned action (TRA) is a well-developed and validated intention model that has been proven successful in predicting and explaining behavior across a wide variety of domains (see Sheppard et al., 1988, for a review). According to TRA, an individual's behavior is driven by the intention to perform the behavior; intention, in turn, is jointly determined by the individual's attitude toward the behavior (i.e., one's positive or negative evaluation of performing the behavior) and by subjective norm (i.e., the perceived social pressure to perform or not to perform the behavior).

TRA assumes that most human social behavior is under volitional control and thus can be predicted from intentions alone (Ajzen, 2002; Fishbein and Ajzen, 1975). To explain behavior that is not completely under volitional control, Ajzen (1985, 1991) introduced the theory of planned behavior (TPB). The TPB extended TRA by adding the construct of perceived behavioral control to eliminate the limitations of the TRA when dealing with behavior over which people have incomplete volitional control. Perceived behavioral control refers to the perceived ease or difficulty of performing the behavior of interest and is assumed to reflect past experience as well as anticipated impediments and obstacles (Ajzen, 1991). The TPB posits that behavior is a direct function of behavioral intention and perceived behavioral control; behavioral intention is formed by one's attitude, subjective norm and perceived behavioral control; attitude, subjective norm and perceived behavioral control are respectively determined by behavioral beliefs (beliefs about the likely outcomes of the behavior and the evaluations of these outcomes), normative beliefs (beliefs about the normative expectations of others and motivations to comply with these expectations) and control beliefs (beliefs about the presence of factors that may facilitate or impede performance of the behavior and the perceived power of these factors). TPB has been successfully used to predict intention and behavior in a wide variety of settings (Ajzen, 1991).

Perceived risk

The concept of perceived risk was first introduced by Bauer (1960) when he characterized consumer choice in terms of risk-taking or risk-reducing behavior (Tan, 2002). Bauer (1960) emphasizes that he is concerned only with perceived risk (subjective risk) and not actual risk (objective risk) because consumers are bounded rational actors that do not perform actual mathematical calculations of risk (unlike actuaries or accountants) and rather form subjective risk beliefs based on internal and external information (Featherman et al., 2006). According to Bauer (1960), a person's behavior involves risk if the behavior will produce consequences that he or she cannot anticipate with anything approximating certainty and some of which are likely to be unpleasant. In the marketing literature, perceived risk is conceptualized as involving two elements: uncertainty and consequences (Campbell and Goodstein, 2001; Conchar et al., 2004; Cunningham, 1967; Dowling and Staelin, 1994; Jacoby and Kaplan, 1972; Laroche et al., 2005). Perceived risk arises when an individual is engaged in situations where the outcomes are never totally certain and is concerned about the consequences of a poor or wrong decision (Fraedrich and Ferrell, 1992; Havlena and DeSarbo, 1991).

The perceptions of risk are considered to be central to a person's evaluations, choices and behaviors (Campbell and Goodstein, 2001). In general, people are prone to avoid mistakes rather than maximize utility when engaging in risky decision-making. Perceived risk is therefore a powerful tool to explain individual behavior (Mitchell, 1999). There have been numerous studies, both theoretical and empirical, identifying risks as critical factors influencing consumer decision making (e.g., Featherman and Pavlou, 2003; Fraedrich and Ferrell, 1992; Jacoby and Kaplan, 1972; Mitchell, 1992; Pavlou, 2003). In recent studies (e.g., Fraedrich and Ferrell, 1992; Tan, 2002), perceived risk is also considered a key variable in determining ethical decision making.

Although perceived risk reveals various meanings and dimensions in different research contexts, most of the scholars view perceived risk as a multi-dimensional construct. For example, Cunningham (1967) divided perceived risk into six risk facets namely performance risk, financial risk, opportunity/time risk, psychological risk, social risk and safety risk. Jacoby and Kaplan (1972) identified five risk dimensions including financial, performance, physical, psychological and social risks and found that the five risk dimensions account for 61.5% of the total variance in the overall risk measure. Other researchers have also suggested that time risk is an important risk dimension (e.g., Roselius, 1971; Stone and Gronhaug, 1993). In addition, Tan (2002) used prosecution risk instead of physical risk and proposed that performance, financial, social and prosecution risks are the most important aspects of risk applicable in the pirated software purchase context.

Conceptual framework and hypotheses

Based on several studies related to TPB and perceived risk, it is hypothesized that behavioral

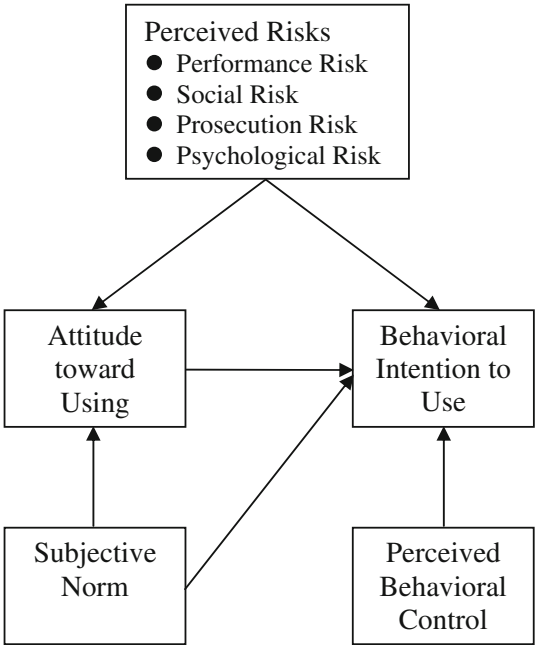

Figure 1. Research model.

intention to use pirated software is predicted by attitude toward using, subjective norm and perceived behavioral control; perceived risks, identified as salient beliefs, influence attitude and intention to use pirated software. Not included in the original TPB, a causal path has been added linking subjective norm to attitude. Figure 1 presents the proposed research model. This section elaborates on the theory base and derives the hypotheses.

The use of pirated software is not completely under volitional control because users of pirated software often lack end-user documentation, technical support and software upgrades for their pirated software, and they must be able to obtain a copy of the software before using it. According to TPB, peoples' behavior is strongly influenced by their confidence in their ability to perform the behavior (Ajzen, 1991). It can be expected that the more resources, knowledge and ability individuals believe they possess (i.e., perceived behavioral control), the stronger should be their intention to use the pirated software. Empirical evidence (e.g., Chang, 1998) demonstrates that TPB is better than TRA in predicting unauthorized software copying. Therefore, in this study TPB is used as a baseline model to verify the TPB hypothesized relationships regarding pirated software use. The following hypotheses are established based on original TPB.

H1: Attitude toward using pirated software will positively affect intention to use pirated software.
H2: Subjective norm will positively affect intention to use pirated software.
H3: Perceived behavioral control will positively affect intention to use pirated software.

There is significant evidence to indicate that attitude and subjective norm are not independent; subjective norm is found to influence attitude (Al-Rafee and Cronan, 2006; Chang, 1998; Lim and Dubinsky, 2005). Lim and Dubinsky (2005) pointed out that persuasion theory (Eagly and Chaiken, 1993) and cognitive dissonance theory (Festinger, 1957) can help explain a person's attitude formation and change. Persuasion theory claims that a person's attitude can be indirectly influenced through the process of internalization of recommendations and arguments received from others and the cognitive dissonance theory states that a person may change his or her attitude toward behavior in order to feel affiliated with significant others. Therefore, positive attitudes toward performing a behavior may arise directly out of information or advice from others about carrying out the behavior (Miniard and Cohen, 1981). When applying TPB to the area of moral behavior, Chang (1998) found that the addition of the causal path from subjective norm to attitude significantly improves the model fit of TPB. Accordingly, one's attitude toward using pirated software is likely to be influenced by significant others.

H4: Subjective norm will positively affect attitude toward using pirated software.

Despite the fact that various risk dimensions have been identified in the risk literature, this study focuses only on four aspects of risks related to the use of pirated software: performance, social, prosecution and psychological risks. Other risk components, such as financial, physical and time risks, are excluded for the following reasons. First, to acquire pirated software, people can choose to download the pirated software from the Internet or borrow and copy it from others rather than buy it. These methods are practically free. Second, performance risk has greater

influence in the use of pirated software than financial and time risks since financial and time risks emerge only when the pirated software fails to function (Tan, 2002). Third, prosecution risk is a more significant and direct factor than financial risk since financial penalty occurs only when the user is prosecuted for software piracy. For these reasons, it is not practical to measure the financial risk. Physical risk as well is not applicable in the context of software piracy as the pirated software does not cause more physical harm or injury to its user than the licensed version.

Perceived performance risk is the possibility that there will be something wrong with the pirated software used (Fraedrich and Ferrell, 1992). The pirated software will arguably be less dependable and reliable than the non-pirated software. Users face performance risk as there is no guarantee that the pirated software will function as well as the non-pirated software (Tan, 2002). The pirated software might malfunction or damage users' computer systems because it might not be fully ''cracked'' and might even contain viruses or spyware. Ancillary to performance risk, the pirated software's failure to work like the licensed version might also subject the user to financial and time risk incurred by restoration of the computing system and/or data recovery (Tan, 2002). Perceived social risk is the probability that the use of pirated software will affect the way others think of the individual (Fraedrich and Ferrell, 1992). Using pirated software is immoral behavior, and such behavior might not be accepted by other society members. A user of pirated software might lose others' respect because they will regard the user as unethical. Also, a user of pirated software might be looked down upon by other society members because they might think that the user cannot afford licensed software (Tan, 2002). Perceived psychological risk is the possibility that an individual suffers mental stress because of his or her use of pirated software (Lim, 2003). Since using pirated software is unethical, the behavior of using pirated software might cause the user to experience psychological discomfort or unnecessary tension. Because the use of pirated software is an infringement of copyright law and users run the risk of civil action by the copyright owner, an additional risk component proposed by Tan (2002) is perceived prosecution risk. It refers to the possibility that using pirated software will subject the user to legal prosecution (Tan, 2002).

Since risk is difficult to capture as an objective reality (Cunningham, 1967), the literature predominantly defines perceived risk as the individual's subjective belief of suffering a loss in pursuit of a desired outcome (Bauer, 1960; Pavlou, 2003; Stone and Gronhaug, 1993). According to Fishbein and Ajzen's (1975) expectancy-value model of attitudes, attitudes toward an object develop reasonably from the beliefs people hold about the object, and in the case of attitudes toward a behavior, each belief links the behavior to a certain outcome or to some other attribute that is already valued positively or negatively (Ajzen, 1991). In this fashion, ''we form unfavorable attitudes toward behaviors we associate with mostly undesirable consequences'' (Ajzen, 1991, p. 191). Accordingly, since the use of pirated software involves uncertainty and might cause adverse consequences, it can be expected that perceived risks would lead to unfavorable attitudes toward using pirated software.

H5: Perceived performance risk will negatively affect attitude toward using pirated software.
H6: Perceived social risk will negatively affect attitude toward using pirated software.
H7: Perceived prosecution risk will negatively affect attitude toward using pirated software.
H8: Perceived psychological risk will negatively affect attitude toward using pirated software.

A number of studies also showed that perceived risk has a negative influence on intention (e.g., Featherman and Pavlou, 2003; Pavlou, 2003; Tan, 2002). The direct path from perceived risk to intention violates the TRA model, which claims that the attitude toward behavior completely mediates the relationship between behavioral beliefs and intention. In fact, empirical evidence has demonstrated that beliefs are even stronger predictors of intention than attitude in some cases. For example, the technology acceptance model (TAM) (Davis et al., 1989) is an adaptation of the TRA that specifies two beliefs, perceived usefulness and perceived ease of use, as determinants of behavioral intention to utilize an information technology (IT). It has been shown that perceived usefulness has a stronger direct influence on intention than attitude (Venkatesh et al., 2003). This is because an individual's intention to use an IT may be based on the

instrumental considerations regardless of his or her attitude toward the activity. Individual belief of perceived risk might also have an independent, direct influence on engaging in risky behavior. When perceived risk is high, people become more wary and risk averse (Campbell and Goodstein, 2001). A rational individual would rather avoid risk if he or she is given the option to do so (Tan, 2002). Conversely, an individual tends to make more risky decisions when perceived risk is low (Sitkin and Weingart, 1995). Therefore, when risk is present, an individual's intention to perform an activity might be based on the risk considerations about the activity regardless of his or her attitude toward the activity. In the context of pirated software use, the four relevant risk components mentioned above should also have a direct negative influence on intention to use pirated software.

H9: Perceived performance risk will negatively affect intention to use pirated software.
H10: Perceived social risk will negatively affect intention to use pirated software.
H11: Perceived prosecution risk will negatively affect intention to use pirated software.
H12: Perceived psychological risk will negatively affect intention to use pirated software.

Method

Instrument development

The research model was validated through an online survey study. The survey instruments were developed based on previous studies and instruments. All scale items were rephrased to relate specifically to the use of pirated software. The scales for perceived performance risk (PPER), perceived social risk (PSOR) and perceived prosecution risk (PPRR) were adapted from Tan (2002). Measure for perceived psychological risk (PPSR) was adapted from Stone and Gronhaug (1993). Measures for subjective norm (SN), perceived behavioral control (PBC) and attitude (A) were adapted from Taylor and Todd (1995). Intention (INT) was based on Peace et al. (2003). A preliminary version of the instrument was reviewed by three doctoral students for precision and clearness. Subsequently, the instrument was pre-tested by administering it to 12 selected respondents of different ages, sexes and levels of education in order to verify its appropriateness and comprehensiveness. In this way the content validity of the instruments was assessed. None of these phases revealed any major problems, but only a few respondents provided comments on the length of the instrument, the format and wording of the scales. We therefore made minor modifications to progressively refine, simplify and shorten the questionnaire based on those comments. The final set of items used for each construct is shown in Appendix.

Data collection

A Web-based survey was conducted via an electronic questionnaire to verify the theoretical model. An invitation to participate was posted on popular forums and message boards in Taiwan. The objectives of the research were explained, and a hyperlink was set up directing interested individuals to the Web-based survey. As an incentive to participate, respondents were offered a chance at winning up to an NT$ 500 (approximately US$ 15) cash prize. Over a period of 2 months, a total of 305 valid questionnaires were collected. All were fully completed as incomplete responses were not accepted by the survey system. The IP addresses of all the responses were recorded, and any repeated accesses from computers with the same IP addresses were not discovered. Of the 305 respondents, over half were male (167 respondents, 55%). The majority of the respondents (202 respondents, 66%) fell into the age group of 20–29 years, which matched the target user group of the Internet. Seventy-four percent of the respondents (227 respondents) had at least some college education. Most respondents (241 respondents, 79%) had experience in using pirated software.

Data analysis and results

Structural equation modeling (SEM) was used to validate the research model. Following Anderson and Gerbing's (1988) guidelines, data analysis was carried out in accordance with a two-stage

methodology. First, a confirmatory factor analysis (CFA) was performed to evaluate convergent and discriminant validity of the constructs. Next, a structural equation analysis to test the research hypotheses empirically was applied. LISREL 8.51 was used to perform these analyses.

Measurement model

A CFA was conducted to test the measurement model with all the constructs. The adequacy of the measurement model was evaluated on the criteria of overall fit with the data, reliability, convergent validity and discriminant validity. First, seven common model-fit measures were used to assess the model's overall goodness-of-fit: the ratio of χ^2 to degrees-of-freedom (d.f.), root mean square error of approximation (RMSEA), goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), normed fit index (NFI), nonnormed fit index (NNFI) and comparative fit index (CFI). As shown in Table I, all the model-fit indices surpassed the recommended value (χ^2/d.f. = 1.878, RMSEA = 0.053, GFI = 0.908, AGFI = 0.872, NFI = 0.947, NNFI = 0.967, CFI = 0.974), demonstrating an acceptable goodness-of-fit between the measurement model and the observed data. Next, the convergent validity of the measurement items was assessed by item reliability, composite reliability and the variance extracted measure. The results of the test of convergent validity are shown in Table II. All measures surpassed the required minimum threshold recommended by Hair et al. (1998), demonstrating convergent validity of the measurement items. Finally, Table III presents the discriminant validity statistics. The square root of each construct's average variance extracted (AVE) (diagonal elements of Table III) is much larger than its correlations with other constructs, thereby indicating adequate discriminant validity (Pavlou, 2003). In summary, the measurement model demonstrated adequate reliability, convergent validity and discriminant validity.

Structural model

As in the case for the measurement model, the same set of fit indices was used to examine the structural model, and the results are shown in Table I. All the model-fit indices surpassed the recommended minimum threshold (χ^2/d.f. = 1.868, RMSEA = 0.053, GFI = 0.908, AGFI = 0.873, NFI = 0.946, NNFI = 0.967, CFI = 0.974), demonstrating a good fit between the structural model and the data. Thus, an examination of the path coefficients of the structural model was conducted. The empirical results are summarized in Table IV. Attitude ($\beta = 0.47$, $p < 0.01$) is the most influential predictor of intention, thus validating H1. Perceived behavioral control ($\gamma = 0.27$, $p < 0.01$) is positively associated with intention, rendering support for H3. However, subjective norm ($\gamma = -0.09$) has a non-significant effect on intention. Therefore, H2 is not supported by the data. Subjective norm ($\gamma = 0.21$, $p < 0.01$) is a significant antecedent of attitude, thus validating H4. Of the four identified risk components, performance risk ($\gamma = -0.05$), social risk ($\gamma = -0.08$) and prosecution risk ($\gamma = -0.07$) have a non-significant effect on attitude, whereas psychological risk ($\gamma = -0.41$, $p < 0.01$) is a strong

TABLE I

Fit indices for measurement and structural models

Fit indices	Recommended value	Measurement model	Structural model
χ^2/d.f.	≤5.00 (Hair et al., 1998)	1.878	1.868
RMSEA	≤0.08 (Hair et al., 1998)	0.053	0.053
GFI	≥0.90 (Gefen et al., 2000)	0.908	0.908
AGFI	≥0.80 (Gefen et al., 2000)	0.872	0.873
NFI	≥0.90 (Hair et al., 1998)	0.947	0.946
NNFI	≥0.90 (Hair et al., 1998)	0.967	0.967
CFI	≥0.90 (Gefen et al., 2000)	0.974	0.974

TABLE II

Measurement model fit indices for convergent validity

Construct	Indicator loading[a]	Item reliability	Composite reliability	Variance extracted
Recommended value		>0.50	>0.70	>0.50
Perceived performance risk (PPER)			0.87	0.70
PPER1	0.88	0.77		
PPER2	0.79	0.63		
PPER3	0.83	0.70		
Perceived social risk (PSOR)			0.92	0.86
PSOR1	0.94	0.88		
PSOR2	0.91	0.83		
Perceived prosecution risk (PPRR)			0.92	0.85
PPRR1	0.90	0.81		
PPRR2	0.94	0.89		
Perceived psychological risk (PPSR)			0.95	0.86
PPSR1	0.91	0.83		
PPSR2	0.94	0.89		
PPSR3	0.93	0.87		
Subjective norm (SN)			0.90	0.81
SN1	0.86	0.75		
SN2	0.94	0.88		
Perceived behavioral control (PBC)			0.93	0.81
PBC1	0.84	0.71		
PBC2	0.93	0.86		
PBC3	0.93	0.87		
Attitude toward using (A)			0.92	0.73
A1	0.81	0.65		
A2	0.85	0.72		
A3	0.93	0.87		
A4	0.83	0.69		
Behavioral intention to use (BI)			0.94	0.84
BI1	0.94	0.89		
BI2	0.93	0.87		
BI3	0.86	0.75		

[a]All indicator loadings were significant at $p = 0.01$.

predictor of attitude. Therefore, H5, H6 and H7 are not supported, whereas H8 is supported. However, in terms of the antecedents of intention, prosecution risk ($\gamma = -0.23$, $p < 0.01$) is a significant antecedent, whereas performance risk ($\gamma = -0.05$), social risk ($\gamma = -0.09$) and psychological risk ($\gamma = 0.00$) are not significant. Therefore, H11 is supported, whereas H9, H10 and H12 are not supported. The explained variance of intention is 60% ($R^2 = 0.6034$), while attitude is 32% ($R^2 = 0.3176$).

Discussion

The results indicate that not all the TPB-hypothesized relationships are supported. Attitude and perceived behavioral control are significant antecedents of intention, but subjective norm is not a significant predictor of intention. The non-significant relationship between subjective norm and intention has also been found in some previous piracy studies (e.g., Chang, 1998; Cronan and Al-Rafee, 2008).

TABLE III

Inter-construct correlations

Construct	PPER	PSOR	PPRR	PPSR	SN	PBC	A	BI
PPER	**0.836**							
PSOR	0.394	**0.925**						
PPRR	0.533	0.618	**0.922**					
PPSR	0.485	0.652	0.758	**0.929**				
SN	0.009	0.256	0.080	0.154	**0.902**			
PBC	−0.123	0.002	−0.160	−0.176	0.537	**0.902**		
A	−0.314	−0.363	−0.432	−0.500	0.090	0.193	**0.856**	
BI	−0.403	−0.449	−0.550	−0.564	0.053	0.335	0.640	**0.914**

PPER, perceived performance risk; PSOR, perceived social risk; PPRR, perceived prosecution risk; PPSR, perceived psychological risk; SN, subjective norm; PBC, perceived behavioral control; A, attitude toward using; BI, behavioral intention to use. Diagonals represent the square root of the AVE.

TABLE IV

Summarized results of hypothesis testing

Causal path	Hypotheses	Expected sign	Standardized structural coefficient	*t*-value
Attitude → intention	H1	+	0.47★	8.49
Subjective norm → intention	H2	+	−0.09	−1.52
Perceived behavioral control → intention	H3	+	0.27★	4.59
Subjective norm → attitude	H4	+	0.21★	3.57
Performance risk → attitude	H5	−	−0.05	−0.64
Social risk → attitude	H6	−	−0.08	−0.92
Prosecution risk → attitude	H7	−	−0.07	−0.69
Psychological risk → attitude	H8	−	−0.41★	−3.85
Performance risk → intention	H9	−	−0.05	−0.97
Social risk → intention	H10	−	−0.09	−1.31
Prosecution risk → intention	H11	−	−0.23★	−2.70
Psychological risk → intention	H12	−	0.00	0.03

★$p < 0.01$.

Therefore, an individual's intention to use pirated software does not seem to be positively affected by the approval of significant others. There are several possible explanations for the result. First, the use of pirated software is illegal and unethical behavior. Prior research suggested that when engaging in unethical behavior, individuals need to consider not only perceived social pressures, but also personal feelings of moral obligation or responsibility to perform, or refuse to perform, such behavior (Ajzen, 1991). Second, the fact that users themselves must undertake the risks of being caught and punished might also attenuate the influence of normative pressure on intended use of pirated software. Finally, Venkatesh et al. (2003) argued that individuals are more likely to comply with others' expectations when those referent others have the ability to reward the desired behavior or punish non-behavior. This argument could provide another perspective to help explain why subjective norm has no significant influence on intended use of pirated software. In addition to verifying the TPB-hypothesized relationships, the causal path linking subjective norm to attitude was tested. The results show that the causal

path from subjective norm to attitude is significant, which is consistent with past findings (e.g., Al-Rafee and Cronan, 2006; Chang, 1998; Lim and Dubinsky, 2005). Therefore, one's attitude toward using pirated software might be influenced by his or her perception of social pressure to perform or not to perform the behavior.

While Tan (2002) found that perceived performance risk is a significant predictor of intention, our results demonstrate that perceived performance risk has no significant influence on either attitude or intention toward using pirated software. A possible explanation of the findings may be the following. With the progress in software development and the rise in computer literacy, users nowadays are likely to resolve most of problems caused by the pirated software and avoid losses by using effective antivirus and recovery tools. Therefore, the performance risk might no longer be a main concern regarding the decision to use pirated software.

Also, perceived social risk is not a significant predictor of attitude and of intention toward using pirated software. This result is contradictory to Tan's work (2002) in which social risk has a significant influence on intention to purchase pirated software. This non-significant result could be attributed to cultural and economic factors. Husted (2000) indicated that certain cultural values may either foster or inhibit software piracy within a given cultural group. Swinyard et al. (1990) argued that Asians seem to have more acceptance for software piracy than Westerners because Asian cultures traditionally emphasize that individual developers or creators are obliged to share their developments with society and believe that copyright is a Western concept created to maintain a monopoly over the distribution and production of knowledge and knowledge-based products. Gopal and Sanders (2000) indicated that the lower a country's annual per capita Gross National Product (GNP), the higher the rate of software piracy. Therefore, when users of pirated software are in countries where most people cannot afford relatively expensive software packages, they are less likely to worry that others will look down on them because of their use of pirated software. To resolve the conflict results of previous research, further study may be required to empirically investigate and compare, from cultural and economic perspectives, the impact of perceived social risk on attitude and intention between Asian and Western countries.

Of the four identified perceived risk components, the risks applicable in the context of pirated software use are prosecution and psychological risks. The negative relationship between perceived prosecution risk and intention suggest that as the chances of being caught increase, individual intention to use pirated software will diminish. However, perceived prosecution risk has no significant impact on attitude toward using pirated software. The results imply that legal punishment might deter one's intended use of pirated software, but does not influence his or her attitude toward the behavior. The attitude formation might have more dependence on perceived psychological risk. Perceived psychological risk has a significant influence on attitude toward usage, but has no significant impact on behavioral intention to use pirated software. The results suggest that the perceived psychological risk indirectly influences one's behavioral intention through the effect on his or her attitude toward the behavior. Perceived psychological risk is the potential loss of self-image or self-concept as the result of the use of pirated software (Fraedrich and Ferrell, 1992). Using pirated software is unethical, and individuals might feel more guilt or moral obligation toward such behavior. The perceived psychological risk, therefore, has a strong impact on attitude; the more perceived psychological risk, the less approving attitude toward using pirated software. However, the non-significant relationship between perceived psychological risk and intention indicates that although individuals might suffer some mental stress while using pirated software, the perception of psychological risk might not be sufficient to determine their intention to use pirated software.

Implications for theory

While TPB has been successfully applied to various situations in predicting human behavior, caution must be taken when applying TPB to the context of pirated software use. The relationship between subjective norm and intention is not demonstrated to be consistent in prior piracy studies. Some studies (e.g., Kwong and Lee, 2002; Lin et al., 1999; Peace et al., 2003) found that subjective norm is a significant predictor of intention, but others (e.g., Chang, 1998; Cronan and Al-Rafee, 2008), including the present study, indicated that subjective norm has no significant

effect on intention. The inconsistency could be attributed to the influence of contextual aspects. The relationship between subjective norm and intention tends to be significant in the contexts of software piracy by individuals in the workplace (e.g., Lin et al., 1999; Peace et al., 2003), but non-significant in the contexts of software piracy in private usage (e.g., Chang, 1998; Cronan and Al-Rafee, 2008). In addition, the results show that attitude and subjective norm are not as independent as the TRA and TPB predict. Subjective norm might have an impact on attitude toward using pirated software. Therefore, our study can provide insight into the applicability of TPB in explaining the use of pirated software and help develop more effective behavioral intention models of pirated software use.

Although perceived risk has been identified as a critical factor influencing individual decisions and behavior, little research has been devoted to investigating how perceived risk can influence individual decisions to use pirated software and which risk components are associated with the decisions. This study enriches understanding of the role of perceived risk in predicting the use of pirated software. Our results indicate that not all identified components of perceived risk significantly influence the decisions to use pirated software. Only prosecution and psychological risk were found to be the salient beliefs influencing the use of pirated software. Given the findings, it is necessary to examine the role of perceived risk and its components when uncertainty regarding possible negative consequences may be present. In addition, the dominant risk components and their relative importance may vary across research contexts. For example, Tan (2002) found that financial, performance, prosecution and social risks significantly influence consumers' intention to purchase pirated software, and the financial and social risks are relatively strong risk components influencing intention. In this study, we found that prosecution risk is the only risk component influencing intention and psychological risk is the only risk component influencing attitude toward using pirated software. Past piracy studies did not consider the impact of psychological risk on ethical decision making. However, since psychological risk is a significant predictor of attitude toward using pirated software, it can be supposed that psychological risk might have a strong association with attitude toward unethical behavior. Future research should further examine the role of psychological risk in ethical decision making.

Implications for practice

The use of pirated software is not under full volitional control. Resources, knowledge and ability are needed for performing the behavior successfully. For example, users must be able to obtain a copy of the software before they can use it and install and use the pirated software without end-user documentation and technical support. Users of pirated software must solve problems caused by the pirated software's failure to function. Perceived behavioral control can therefore be a significant factor influencing the decisions to use pirated software. When individuals perceive more internal and external constraints in using pirated software, their intention to perform the action will be lower, no matter how favorable their attitude is toward using the pirated software and how much their significant others agree on the behavior. Accordingly, the progress in software development and rise in computer literacy over time might eliminate some constraints and thus increase the intention to use pirated software. Efforts to decrease intention to use pirated software might be accomplished by adopting a technological protection strategy to create barriers (Chiu et al., 2008) and thus decrease users' perception of behavioral control over the pirated software, or even by eliminating the channels and opportunities to acquire pirated software.

An individual's attitude toward using pirated software is clearly a precursor to his or her intention to use the pirated software. Therefore, fostering favorable anti-software piracy attitudes could be helpful in combating and deterring the use of pirated software, and improving and enhancing anti-piracy education would be fundamental and necessary for achieving this purpose. The fact that attitude is the strongest predictor of intention makes it even more important to determine the factors that predict attitude. If we can alter one's attitude toward using pirated software, it should be possible to diminish his or her intended use of pirated software.

Perceived risk does indeed play a role in the decisions to use pirated software. Of the four identified risk components, the psychological risk is the dominant risk component influencing attitude toward using

pirated software. Although psychological risk may be caused by various complex factors, the psychological risk and one's moral philosophy are likely related (Fraedrich and Ferrell, 1992). Individuals who feel more guilt or moral obligation about using pirated software might suffer more mental stress as a result of the use of pirated software, and they would thus have less favorable attitudes toward using it. Therefore, reinforcing individual moral obligation might be one effective way to heighten individual perception of psychological risk and form unfavorable attitudes toward using pirated software. In addition, prosecution risk is the most significant risk component influencing intention to use pirated software, implying that legal penalties might deter the intended use of pirated software. Therefore, in addition to enforcing copyright laws, more aggressive publicity of possible prosecution for using pirated software and media coverage of important piracy cases should be promoted to heighten awareness of the prosecution risk (Chiou et al., 2005). These claims are consistent with recent findings suggesting that legal action can be an effective strategy to discourage online music piracy (Chiu et al., 2008). Legal action could increase users' perception of prosecution risk, which could in turn result in lower intention to use pirated software.

In addition to perceived risks, another crucial factor influencing attitude toward using pirated software is subjective norm. The TRA and TPB assume that individual behavioral beliefs determine his or her attitudes toward the behavior. The fact that subjective norm has an influence on attitude implies that individuals might form or change their behavioral beliefs or attitude toward using pirated software when they perceive that their significant others will approve or disapprove of their use of pirated software. Therefore, although subjective norm has no significant impact on behavioral intention, its influence on attitude formation cannot be ignored. If the atmosphere of rejecting using pirated software can be created in a society, people are likely to form more unfavorable attitudes toward using pirated software.

Limitations and suggestions for future research

The results of this study should be interpreted in light of its limitations. First, despite the fact that the sample population used here was a wider demographic than the student samples typically used in this type of research, it may not be fully representative of the entire population. Caution must be taken when generalizing the results. Second, the validity of any interpretation of the results can be questioned. Given the sensitive nature of the topic, some respondents might have provided socially desirable evaluations in order to appear ethical (Akaah and Lund, 1994). Finally, some studies (e.g., Gopal and Sanders, 1998; Husted, 2000; Swinyard et al., 1990) have found that national culture has an impact on software piracy. The strength and relative importance of the proposed constructs might differ from culture to culture.

In the final section of the paper we will focus on identifying future research areas that appear to have particular promise for making contributions to the field. First, since culture might play a role in predicting piracy behavior, relevant cultural and ethnic characteristics could be investigated to provide an enriched understanding of piracy intentions across nations. Second, the intention-actual behavior relationship has not been tested in this study. While intention is regarded as a proximal determinant of behavior in TRA and TPB, Tan (2002) argued that the intention-behavior relationship may vary because of other intervening factors and situational constraints. Future research can investigate the intention-behavior link and explore other potential factors that contribute to predicting the use of pirated software. Third, this study focuses on the TPB and risk factors related to software piracy. However, it is possible to identify additional factors that influence behavior toward using pirated software. For example, recent research related to digital music piracy indicated that in addition to negative factors such as perceived risk of piracy (Sinha and Mandel, 2008) and legal action (Chiu et al., 2008), the positive factors such as low-price (Chiu et al., 2008) and value-added products or services provided by legitimate software vendors (Chiu et al., 2008; Sinha and Mandel, 2008) might contribute to discouraging piracy. Future research could, from aforementioned perspectives, explore more potential factors influencing the use of pirated software to enrich understanding of piracy behavior. Finally, an additional interesting avenue of investigation might be to examine the relationships among various risk dimensions. Since any of the risk

dimensions could capture some aspects of the overall risk perceived by the actor, it is possible that all these perceptions are related to one another. In particular, it can be argued that the perceived psychology risk might be related to the other dimensions of perceived risk, while the other risk dimensions are likely to lead to one's psychological discomfort. In fact, Stone and Gronhaug (1993) have reported that psychological risk plays an important mediating function for other types of risk to influence overall risk in the context of purchasing a personal computer. In addition, financial and time risks, which were not considered in this study, might be associated with the other risk dimensions. Therefore, future research could examine more detailed facets of perceived risk and explore the relationships among various risk dimensions in the context of software piracy to address the issue.

Appendix: List of items by construct

Perceived performance risk (PPER)

PPER1: What is the probability that pirated software will fail to work like the original one? (very low/very high)
PPER2: What is the probability that pirated software will malfunction or damage your computer system? (very low/very high)
PPER3: What is the probability that pirated software will fail to function? (very low/very high)

Perceived social risk (PSOR)

PSOR1: If your friends, relatives or associates are aware that you have used pirated software, what is the probability that they will look down on you because they think that you cannot afford original software? (very low/very high)
PSOR2: If your friends, relatives or associates are aware that you have used pirated software, what is the probability that you will lose their respect because they will regard you as unethical? (very low/very high)

Perceived prosecution risk (PPRR)

PPRR1: If you have used pirated software, what is the probability that you will be caught for the infringement of copyright law? (very low/very high)
PPRR2: You may be arrested for infringement of copyright law if you have used pirated software. (strongly disagree/strongly agree)

Perceived psychological risk (PPSR)

PPSR1: Using pirated software makes me feel psychologically uncomfortable. (strongly disagree/strongly agree)
PPSR2: Using pirated software gives me a feeling of unwanted anxiety. (strongly disagree/strongly agree)
PPSR3: Using pirated software causes me to experience unnecessary tension. (strongly disagree/strongly agree)

Subjective norm (SN)

SN1: People who influence my behavior would think that I should use pirated software. (strongly disagree/strongly agree)
SN2: People who are important to me would think that I should use pirated software. (strongly disagree/strongly agree)

Perceived behavioral control (PBC)

PBC1: I would be able to make effective use of pirated software. (strongly disagree/strongly agree)
PBC2: Using pirated software is entirely within my control. (strongly disagree/strongly agree)
PBC3: I have the resources and the knowledge and the ability to make use of pirated software. (strongly disagree/strongly agree)

Attitude toward using (A)

A1: Using pirated software is a (very bad/very good) idea.
A2: Using pirated software is a (very foolish/very wise) idea.

A3: I (really dislike/really like) the idea of using pirated software.
A4: Using pirated software would be: (very unpleasant/very pleasant).

Behavioral intention to use pirated software (BI)

BI1: I may use pirated software in the future. (strongly disagree/strongly agree)
BI2: If I have the opportunity, I will use pirated software. (strongly disagree/strongly agree)
BI3: I would never use pirated software. (strongly disagree/strongly agree) (reverse coded)

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National Chung Cheng University,
Ming-Hsiung, Chia-Yi, Taiwan
E-mail: ccliao@mis.ccu.edu.tw