

An empirical study of software piracy

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Introduction

In the 1950s, when computer programs first began to be used in the scientific community, software copyright issues were ignored (Samuelson 1993). Computer programs were often developed by one researcher and then further improved or extended by others in the same field. Afterwards, as personal computers began to be widely used by the general public, commercial developers began to create computer programs to meet the increasing demands of the software market. Commercial developers invest a lot of resources in new computer software but such software is relatively easy to copy (that is, to steal). The protection of ownership of software rights has therefore become an important issue.

“Software piracy” can be defined as the unauthorised use of computer software or the unauthorised distribution of copies of software without permission being given by the owner (BSA 2002). More than US\$10.97 billion was lost worldwide in 2001 due to software piracy (BSA 2002). However, the situation had improved in 2001, as compared with 2000. The revenue loss of the worldwide software industry due to software piracy amounted to S\$10.97 billion in 2001, a 6.7% decrease from 2000 (BSA 2002). However, taking into consideration the global reduction of software prices, the software piracy problem was still a very significant problem for the software industry.

In the Asia-Pacific region, the average piracy rate was 54% in 2001, meaning that 54% of all software used in the region was pirated software. However, an interesting picture appears in the

statistics provided by BSA (2002). Table 1 shows that, the piracy rates of some developed countries in the region in 2001 were relatively low, such as Australia (27%), New Zealand (25%) and Japan (37%). But in other (developing) countries, such as China and Vietnam, the piracy rates were more than 90%. In mainland China for example, 92% of the software installed during 2001 was pirated (see Table 1). This resulted in an estimated loss to the copyright owners of US\$1.66 billion (BSA 2002).

Model of software piracy

Most previous research in this field has focused on losses due to software piracy (Givon, Mahajan, and Muller 1995) and the weaknesses of legislation to protect intellectual property (Koen and Im 1997, Malhotra 1994, Straub and Collins 1990). Relatively little research has investigated the determinants of software piracy. The present study therefore performed a more detailed investigation of the basic elements of software piracy. Rather than focusing on law enforcement alone, the present study concentrated equally on both the social and environmental influences of the software piracy problem in Hong Kong, and attempted to set up an integrated ‘model of leniency’ towards software piracy with a view to filling the research gaps in software piracy.

This study attempted to analyse software piracy on the basis of the theory of reasoned action (Ajzen and Fishbein 1980). Previous research has shown that monetary benefit was the main motive in driving people to become involved in software

Table 1: 2001 BSA/SPA Piracy Study Results (Selected Countries in the Asia-Pacific Region)

	Piracy Rates (%)			Retail Revenue (US\$1000)		
	1999	2000	2001	1999	2000	2001
Australia	32	33	27	150,390	132,533	91,011
China	91	94	92	645,480	1,124,395	1,662,404
Hong Kong	56	57	53	110,190	86,195	164,040
Indonesia	85	89	88	42,106	69,991	79,463
Japan	31	37	37	975,396	1,666,331	1,721,050
Korea	50	56	48	197,269	302,938	186,574
Malaysia	71	66	70	84,154	95,567	94,544
New Zealand	31	28	26	19,656	12,373	11,445
Philippines	70	61	63	33,163	27,091	24,655
Singapore	51	50	51	61,758	44,299	41,802
Taiwan	54	53	53	122,946	154,754	136,735
Thailand	81	79	77	82,183	53,082	41,123
Vietnam	98	97	94	13,106	34,938	32,246

Source: BSA (2002), p. 7.

piracy. The present study was an exploratory attempt to analyse software piracy systematically, using an approach based on empirical factors, rather than ethical factors. The empirical factors studied were: (i) the social acceptance of pirated software; (ii) the price of original software; (iii) availability of original software; (iv) the need for computer software; and (v) knowledge of copy-right law.

(i) Social acceptance of software piracy

Whether a person will use pirated software depends, in part, on whether he or she is being influenced by other people. A modified diffusion model (Givon, Mahajan and Muller 1995) suggested that the external influences (such as promotion by the mass media of pirated software, and influence by word-of-mouth interactions among users) affect decisions to use pirated software. They found similar intensity of the word-of-mouth influence on pirated and original versions.

“Influence relates to the processes whereby people agree or disagree about appropriate behaviour, form, maintain or change social norms and the

social conditions that give rise to, and the effects of social norms.” (Turner 1991: 2)

People’s perceptions of a particular behaviour are shaped by the existing value system of the society. People change their attitudes, beliefs, and even behaviour in reaction to real or imagined social influences (Baron and Byrne 1997). In a review of social psychological theories, Festinger (1954) hypothesized that humans are driven by self-evaluation with others and seek for similarity. Bernheim (1994) has observed that social factors, such as desire for prestige, self-esteem, popularity, and acceptance, are the key determinants of individual behaviour. Socially acceptable behaviours have been defined as behaviours “producing, maintaining, or enhancing positive effects for the interactor” (Foster and Ritchey 1979: 626). It has been argued that people tend to seek perceived similarity. People therefore develop standards that protect their image in the eyes of other people. Social pressure is a powerful determinant of behaviour.

Ryan and Bonfield (1975) reviewed ten research papers, and found that the average multiple correlation of attitudes and subjective norms on behavioural intentions was 0.60. The review

supports the theory that reasoned action is a reliable predictor of behaviour. If people's perceptions are inconsistent with social acceptability of a particular behaviour, there is a greater tendency for people to change their own value judgment to match the standards set by others (Buehler and Griffin 1994, Griffin and Buehler 1993). If everybody else is behaving in a certain way, it must be appropriate. According to differential association theory, attitudes to criminal acts are relaxed when criminal norms are dominant in the society (Jackson, Tittle and Burke 1986). If perceptions of crime are normatively acceptable, there is a higher degree of tolerance to the deviant behaviour. Loch and Conger (1996) found that what is learnt by an individual in an organization is very dependent on the existing rules and the behaviour of colleagues. Existing guidelines and procedures regarding ethical decision-making in computer use have a significant effect on the way that people intend to behave.

In addition, Givon, Mahajan and Muller (1995) suggested that the psychological ease with which people obtain pirated software, and social influences from people using pirated software, could explain why people are so eager to use pirated software. It was hypothesised that, although people knew that copying software was wrong, they were prepared to use it because this behaviour was approved by others.

The present study therefore proposes the following hypothesis:

H1: Social acceptance of software piracy is positively correlated with lenient attitudes to software piracy.

(ii) Pricing strategy of the original software

The cost of the software is a vital factor in the popularity of pirated software. Jussawalla (1992) noted that advanced computer technology makes pirate activities cheaper than before. With the help of CD-ROM, people can put more than 500 megabytes (MB) of copied data (including programs) on a compact disk, at a cost of less than HK\$0.07 per MB as compared with HK\$4 per MB from a 1.44MB floppy diskette. The new CD-ROM technology has made the pirating problem more serious (Caborn 1997). The combination of

lower cost and higher quality of data retrieval created the underground CD-ROM market (Apple Daily 1998). For example, Oracle, an expensive software database system, can be purchased for US\$25 in the Asian pirated software market, compared with a cost of US\$20,000 for the real thing (Caborn 1997).

These sellers of illegal CD-ROM disks do not have to bear the cost of the most expensive aspect of software creation that is, research and development for the next generation of software. They can sell these CD-ROM disks at very low price compared with those of the software developers. Most of the popular applications can be contained within a pirated 644-MB CD-ROM. These applications include Adobe Photoshop, AutoCAD, Microsoft Windows, Microsoft Office, Norton Utilities, and so on (Rapaport 1997).

Other than the price, there is a little difference between the original version and the copy, and the general public might have a perception that "software is a free good rather than a consumer good" (Weisband and Goodman 1992: 87).

In tackling the problem of software piracy, Glass and Wood (1996) borrowed the equity theory of Adams (1963) and Homans (1961) to show the relationship between people's perceptions of software piracy (situational factors) and the cost of the software being pirated. It was suggested that:

"The higher the price of the software paid by an individual, the greater the value of his or her perceived input to the exchange and consequently the lower the perceived favorableness of the exchange" (Adams 1963: 1192).

There were 271 undergraduate business students participating in the study of Glass and Wood (1996). Three scenarios were used in the questionnaire in order to measure the attitudes of the subjects about copying software based on different price levels. The findings supported the Glass and Wood (1996) hypothesis. However, the study focused on the willingness of people to allow others to make an illegal copy of their own legal copy of software. It was not aimed at measuring the correlation between the retail price and the piracy rate.

Taken together, all the arguments above support the following hypothesis:

H2: The price of original software is positively correlated with lenient attitudes to software piracy.

(iii) Sense of urgency for computer software

Rossouw (1994) suggested that the first and most important factor causing immoral business conduct in developing countries was the need for software. Some people cannot afford to get what they want to survive in the face of fierce international competition. To sustain and satisfy their economic needs, people are forced to make certain business decisions that are otherwise questionable in the normal business world.

According to Wasch (1995), it has been estimated that more than 750,000 personal computers were sold in China during 1993 and 1994, whereas original software packages worth only about US\$1,000,000 were imported into China during the first three seasons in 1994. That means each user spent only US\$1 on average in purchasing original software. This is very unexpected because computer hardware cannot work without software, and such a huge demand in computer hardware should be reflected in a similar demand for computer software.

The factor of need is well summarized by Lin (1995: 88) who noted:

"It's just a matter of necessity. We want the software and we want it now. We need it. But we can't get it any other way: the real stuff is overpriced, and there's zero support".

As a result of the above discussion, the following hypothesis is proposed:

H3: A sense of urgency in the need for computer software is positively correlated with lenient attitudes to software piracy.

(iv) Availability of original software

Availability of the original software has also been identified as an important factor in piracy in developing countries. Gurnsey (1995) noticed that the ease with which the end user can obtain and exchange pirated software as compared with

original software provides easy opportunities for people who want to use advanced computer software without paying large sums of money to software houses.

Pagell (1990: 5) illustrated the problem as follows:

"Adherence to copyright may be expected only when the originals are easily available in a timely manner at a reasonable price".

In Asian counties, such as Hong Kong, China and Taiwan, people can now easily buy from a computer shop CD-ROM disks containing a variety of expensive computer applications, including Microsoft® Office, Adobe® Photoshop®, Corel Draw, and so on. There are crowds of people in the shopping malls of Hong Kong and China where unauthorized copies of CD-ROMs are sold (Economist, 1997).

Poor availability of original software affects attitudes to pirated software. This argument leads to the following hypothesis.

H4: The availability of original software is negatively correlated with lenient attitudes to software piracy.

(v) Knowledge of computer software copyright law

The computer software industry relies strongly on licensing agreements that are aimed at protecting valuable products against unauthorized copying. When people purchase original software from a computer shop, they receive a user registration form and a licence agreement. As noted by Branscomb (1994), most of the licence agreements for computer software are printed in a very small font size and are very complicated for people to read. They ask the end user not to "use, copy, modify, merge, translate, or transfer" the software. When the user tries to install the software into a personal computer, the program automatically jumps to a prompt asking the end-user to accept the licence agreement before the installation process takes place. However, only a few users pay attention to such statements. Copying of software can be viewed as the violation of the licensing agreement, provided that the copied

version is not used for backing-up the original software but for running in the computer.

Gurnsey (1995: 31) has pointed out that the concept of 'software copyright' is completely incompatible with Asian economies:

"In many developing (and other) countries, and not least theocratic societies, the concept of copyright is not just poorly understood and accepted, it is actually alien. Thus, when Altbach writes 'copyright, historically, was not part of the Asian culture', he is undoubtedly right. This makes it questionable whether the current policy which pervades much Western thinking, that of using duress to impose copyright on developing countries, is either justified or ethical".

In Japan, the most successful and wealthy country in the region, the piracy rate in 1995 was the highest of the G7 group of wealthy industrialized nations. According to West (1995: 1130):

"The Japanese philosophic premise is that knowledge should be shared widely across industry to maximize social utility."

In summary, it is hypothesized that:

H5: Increased knowledge of computer software copyright law is negatively correlated with lenient attitudes to software piracy.

Research design

The research design consisted of quantitative studies, including a pilot test and primary research, via a survey of computer end-users in the form of a self-administered questionnaire. After the pilot test, scale items were refined to improve understanding of the construct. The refined questionnaire was then sent out, and was completed by a large pool of subjects.

The instrument began with a cover page providing a brief description of the purpose of the survey and an assurance of anonymity. Respondents were asked to complete the questionnaire. The questions were open-ended, and did not call for any 'right' or 'wrong' answer.

The questionnaire contained seven broad categories of questions. The first category assessed the importance of other people in the selection of

computer software. Four items were borrowed from Bearden, Netemeyer and Teel (1989) dealing with consumer susceptibility to interpersonal influence. The second category assessed the importance of the availability of original software when choosing pirated software rather than originals. The third category was concerned with the pricing strategies of software developers. Five items were borrowed from Gaski and Etzel (1986) on the index of consumer sentiment with respect to marketing. The fourth category assessed the urgency of computer software. Seven items were borrowed from Mano and Oliver (1993) on need evaluation. The fifth category assessed respondents' knowledge of intellectual property protection. The sixth included three questions assessing respondents' actual purchasing behaviour of pirated software and their reported leniency towards software piracy. The last section allowed respondents to indicate their demographic information.

Profile of the research sample

The research sample contained 263 observations resulting from responses to a 30-item survey instrument including 6 demographic items and 24 model items. The respondents were visitors to the Information Infrastructure Expo held in March 2002 who participated in the study voluntarily. Of the respondents 57% were male (Table 2). There was significant diversity in the income distribution of the respondents (Table 3). With respect to educational level, 62% had attended university (Table 4).

Factor analysis and reliability of the constructs

The exploratory factor analysis was conducted using principal components and varimax rotation

Table 2: Gender Distribution of the Respondents

Gender	Frequency	Percentage
Male	149	56.7
Female	114	43.3

Table 3: Income Distribution of the Respondents

Range of monthly household income	Frequency	Percentage
HK\$0–HK\$9,999	5	1.9
HK\$10,000–HK\$19,999	31	11.8
HK\$20,000–HK\$29,999	114	43.3
HK\$30,000–HK\$39,999	38	14.4
HK\$40,000–HK\$49,999	32	12.2
HK\$50,000–HK\$59,999	26	9.9
HK\$60,000 or above	17	6.5

Table 4: Educational Level of the Respondents

Level	Frequency	Percentage
Primary or below	2	0.8
Secondary or technical college	97	36.9
University	164	62.4

to identify patterns in factors affecting respondents' leniency towards software piracy. Table 5 presents the factor solution for the variables. Based on the combined heuristics involving eigenvalues (Kaiser 1958) and the scree plot (Cattell 1966), five factors were identified. Each of these factors has an eigenvalue greater than 1.0, and together they explained 70.53% of the total variance.

The results of the exploratory factor analysis sought to match findings from previous research. For each factor, the measures used *a priori* all loaded heavily on the factor (Table 5). The results suggested a high convergent validity for the study. In addition, these items did not load more highly on other factors than they did on the intended factor, thus suggesting high validity of discrimination.

Reliability of the constructs was assessed using Cronbach's alpha coefficient – that is, the degree of covariation among the scale items. It has been suggested that 0.50 is a minimum acceptable limit for Cronbach's alpha (Churchill 1979). Table 6 presents the value of alpha for each construct. All

factors have acceptable Cronbach alpha reliability scores of 70% and higher. In the study, three groups of data were used for the analysis – (i) the whole home-user group; (ii) the male home-user group; and (iii) the female home-user group. As a result, different alphas were found in the same construct, due to the different samples sizes.

Regression analyses

The testing of the hypotheses (H1–H5) concerning the main effects of social, economic, and internal factors on respondents' reported leniency towards software piracy was conducted using multivariate regression analysis. The research model can be expressed algebraically as follows:

$$y = b_0 + b_1x_{h1} + b_2x_{h2} + b_3x_{h3} + b_4x_{h4} + b_5x_{h5}$$

where, y = reported leniency towards software piracy

x_{h1} = social acceptance towards pirated software

x_{h2} = pricing strategy of the original software

x_{h3} = sense of urgency for computer software

x_{h4} = poor availability of original software

x_{h5} = knowledge of software copyright laws

In multiple regression analysis, the relationship of each independent variable (predictor to the criterion) is measured by the slope of the regression line of the criterion y on the predictor. The regression equation was estimated based on the five original predictors and the observed scores (respondents' reported leniency towards software piracy). The regression coefficients b_1 , b_2 , b_3 , b_4 , and b_5 are these slopes in the present regression model.

The results concerning the main effects are presented as standardized regression coefficients in Tables 7, 8, 9 and 10. Both of the models for the home-users groups were significant at the level of $p < 0.001$. For the whole group of home-users, the independent variables explained 81% of variance in the reported leniency towards software piracy ($R^2 = 0.81$, adjusted $R^2 = 0.80$, F value = 131.59, $d/f = 8/263$). For the male group, the independent variables explained 79% of variance in the reported leniency towards software piracy

Table 5: Results of Exploratory Factor Analysis of Independent Variables

Variable	Factor loading
<i>Factor 1. Urgency of computer software</i>	
• Computer software is useful.	0.71
• Computer software is needed.	0.88
• Computer software is vital.	0.65
• Computer software is essential.	0.69
• Computer software is important.	0.74
• Computer software is beneficial.	0.73
• Computer software is fundamental.	0.88
eigenvalue	6.03
Percentage of variance explained	28.70
<i>Factor 2. Social acceptance towards pirated software</i>	
• To make sure I buy the right software, I often observe what others are buying and using.	0.86
• When buying software, it is important for me to get the approval of other people.	0.87
• I often consult other people to help choose the best alternative available for computer software.	0.87
• I achieve a sense of belonging by using the same software that others do.	0.78
eigenvalue	4.11
Percentage of variance explained	19.55
<i>Factor 3. Pricing strategy adopted by the software developers</i>	
• Most original software about which I know is overpriced.	0.82
• Software developers could charge lower prices and still be profitable.	0.74
• Most prices of original software available on the market are reasonable given the high cost of software development [reverse coding].	0.67
• Most prices of original software available in the market are fair [reverse coding].	0.65
• In general, I am satisfied with the prices I pay for original software [reverse coding].	0.71
eigenvalue	2.39
Percentage of variance explained	11.39
<i>Factor 4. Knowledge concerning copyright law</i>	
• I am totally clear about their purpose.	0.69
• I understand completely why copyright protection is necessary.	0.76
• I am an expert on them.	0.73
eigenvalue	1.28
Percentage of variance explained	6.08
<i>Factor 5. Availability of original software</i>	
• It is OK to use the pirated software because I don't know where to purchase its original version.	0.83
• It is OK to use pirated software because it takes me too long to get it through proper channels.	0.81
eigenvalue	1.01
Percentage of variance explained	4.82

($R^2 = 0.79$, adjusted $R^2 = 0.78$, F value = 64.63, $d/f = 8/149$). For the female group, the independent variables explained 85% of variance in the reported leniency towards software piracy

($R^2 = 0.85$, adjusted $R^2 = 0.83$, F value = 72.03, $d/f = 8/114$).

Examination of the control variables revealed that the education level was not statistically and

Table 6: Reliabilities of the Major Constructs

Scales	Participants					
	Male		Female		Whole group	
	N	Alpha	N	Alpha	N	Alpha
(H1) Social acceptance of pirated software	149	0.882	114	0.941	263	0.910
(H2) Pricing strategy of original software	149	0.781	114	0.744	263	0.769
(H3) Urgency of computer software	149	0.887	114	0.866	263	0.879
(H4) Availability of original software	149	.957	114	0.962	263	0.960
(H5) Knowledge concerning copyright law	149	0.866	114	0.970	263	0.913

Table 7: Means, Standard Deviations, Value Range and Correlations

Construct	Mean	S.D.	Value range		1	2	3	4	5	6
			Min.	Max.						
1. Social acceptance	4.12	1.25	1.00	6.50	—					
2. Pricing strategy	6.04	0.58	3.60	7.00	0.10	—				
3. Urgency	4.02	0.83	1.57	5.71	−0.20 ^a	0.09	—			
4. Poor availability	4.15	1.71	1.00	7.00	0.42 ^a	0.34 ^a	−0.03	—		
5. Knowledge	2.95	1.28	1.00	6.00	−0.59 ^a	−0.33	−0.57 ^a	0.14 ^b	—	
6. Leniency	4.85	1.35	1.00	7.00	0.59 ^a	0.46 ^a	−0.07	0.72 ^a	−0.81 ^a	—

Note: N = 263,

^ap < 0.01,

^bp < 0.05

significantly related to the reported leniency towards software piracy in all models. However, monthly household income of the respondents did have a significantly negative relationship with the reported leniency towards software piracy in the female group (beta = −0.12, p < 0.05). The results concerning each of the hypotheses (H1 through H5) are presented in the next section.

Major findings

In this study, hypothesis 1 was proposed in the following terms: 'Social acceptance of software piracy is positively correlated with lenient attitudes to software piracy'. H1 was supported in both the home-users group and the office-users group. The results showed that regression coeffi-

cients of social acceptance had a significantly positive relationship with the reported leniency towards software piracy in both models of computer home users.

Hypothesis 2 proposed that pricing strategy of original software is positively related to the reported leniency towards software piracy. The results showed that regression coefficients of high pricing strategy of original software had significantly positive relationships with the reported leniency toward software piracy in both models of computer home-users. Thus, hypothesis 2 was supported.

Hypothesis 3 predicted that sense of urgency for computer software is positively correlated to the reported leniency towards software piracy. Contrary to hypothesis 4, the results showed that the

Table 8: Regression of Reported Leniency towards Software Piracy on Hypothesized Predictors – Whole Group of Home-Users (Equation 1)

H	Predictors	Relationship	Beta	Sig, T
1	Social acceptance of pirated software	Positive	0.138	0.000
2	Pricing strategy of original software	Positive	0.189	0.000
3	Sense of urgency for computer software	Positive	0.040	0.171
4	Poor availability of original software	Positive	0.294	0.000
5	Knowledge of software copyright law	Negative	– 0.444	0.000
	<i>Control variables</i>			
	Household monthly income level	Negative	– 0.113	0.003
	Education level	Negative	– 0.003	0.914
	R ²	0.806		
	Adjusted R ²	0.799		
	R ² Change	0.806		
	df	8/263		
	F	131.578		
	Sign. F	0.000		

Table 9: Regression of Reported Leniency towards Software Piracy on Hypothesized Predictors – Male Group (Equation 2)

H	Predictors	Relationship	Beta	Sig, T
1	Social acceptance of pirated software	Positive	0.169	0.000
2	Pricing strategy of original software	Positive	0.203	0.000
3	Sense of urgency for computer software	Positive	0.083	0.049
4	Poor availability of original software	Positive	0.316	0.000
5	Knowledge of software copyright law	Negative	– 0.442	0.000
	<i>Control variables</i>			
	Household monthly income level	Negative	– 0.082	0.116
	Education level	Negative	– 0.005	0.910
	R ²	0.787		
	Adjusted R ²	0.775		
	R ² Change	0.787		
	Df	8/149		
	F	64.633		
	Sign. F	0.000		

need for computer software did not have a strong significant relationship with the reported leniency toward software piracy in both models of computer home-users. Thus, hypothesis 3 was refuted.

Hypothesis 4 posited that the poor availability of original software is positively related to the reported leniency towards software piracy, i.e. less

original software available in market, more relaxing towards software piracy. The results showed that regression coefficients of the poor availability of original software had a significantly positive relationship with the reported leniency toward software piracy in both models of computer home-users. Therefore, hypothesis 4 was supported.

Table 10: Regression of Reported Leniency towards Software Piracy on Hypothesized Predictors – Female Group (Equation 3)

H	Predictors	Relationship	Beta	Sig, T
1	Social acceptance of pirated software	Positive	0.115	0.038
2	Pricing strategy of original software	Positive	0.149	0.001
3	Sense of urgency for computer software	Negative	– 0.010	0.812
4	Poor availability of original software	Positive	0.244	0.000
5	Knowledge of software copyright law	Negative	– 0.513	0.000
	<i>Control variables</i>			
	Household monthly income level	Negative	– 0.121	0.021
	Education level	Positive	0.009	0.838
	R ²	0.846		
	Adjusted R ²	0.834		
	R ² Change	0.846		
	df	8/114		
	F	72.031		
	Sign. F	0.000		

Hypothesis 5 predicted that knowledge of software copyright law is negatively related to the reported leniency towards software piracy. In this study, H5 was proposed in the following terms: 'Increased knowledge of computer software copyright law is negatively correlated with lenient attitudes to software piracy'. The regression coefficients of copyright law knowledge had a significant negative relationship with the reported leniency towards software piracy in all models. Thus, H5 was strongly supported.

Discussion

The results of multivariate regression provide solid evidence to support the conceptual framework proposed. The survey and content analysis of messages gathered from the Internet news groups yielded generally similar results. Knowledge of software copyright law and availability of original software had significant regression weights with respect to the reported leniency towards software piracy in both male and female computer users. Therefore, H4 and H5 were the most strongly supported by the study.

This finding is consistent with the result of a recent joint effort between the Singapore Trade

Development Board and the Business Software Alliance (BSA) through an anti-piracy campaign. BSA claimed that the decrease in losses to software piracy for the region in 1998 was due to efforts spent on the promotion of intellectual property protection. Similarly, it was found that knowledge of software copyright in the home-users group in this study had a strong effect.

Pricing strategy of original software was important, but was not the most essential part in the opinion of the computer users with respect to their reported leniency towards software piracy. Similarly, it was found that household monthly income of the computer users was not associated with their reported leniency towards software piracy.

The study has indicated some gender differences. Very few research papers have examined gender differences in the effects of perceived social acceptance of sensitive issues such as software piracy. In the present study, male computer users were more lenient in their attitudes to pirated software than female users. Male computer users were more likely to be lenient when it was encouraged by their social surroundings, whereas females were more likely to think independently. H1 was partially supported, but should be viewed with caution.

The study has identified that sense of urgency for computer software does not affect reported leniency towards software piracy. Weak regression weights were found on sense of urgency for computer software with reported leniency towards software piracy for male computer users. For female computer users, no significant relationship was found.

Contributions of the study

The findings of the present study suggest that efforts to combat software piracy should be directed at promoting intellectual property protection. Lack of knowledge of the consequences of software piracy is a major driving factor of the counterfeit software industry. People do not see buying pirated software as wrong because everyone else is doing it. It creates a demand and software that has been pirated will always be around to fill it. Therefore, it is necessary to reinforce the existence of copyright law to discourage people from committing software piracy. Meanwhile, more effort should be directed to education promoting intellectual property protection. Once people are educated on the impact of software piracy, they might change their attitude and better appreciate the importance of protection against pirated software. Schools need to establish clear guidelines and consolidate intellectual property protection in the existing syllabuses.

Social acceptance of software piracy was found to be one of the key predictors for the reported leniency towards software piracy. From the study, software piracy occurs when there is agreement among social groups. Nelson and Obremski (1990) suggested that peer-led moral discussions can be an effective way to reinforce discipline in education programs. It might be easier for the Business Software Alliance and software developers to affect peer norms towards original software, rather than pirated copies. By clearly indicating a negative view towards software piracy and by creating a climate of disapproval against people being involved in software piracy, it might be possible to deter people's involvement in software piracy.

Pricing strategy of original software was also found to be a driver for a lenient attitude to software piracy. Lowering the price of original software might help to deter software piracy. People might be less likely to consider pirated software if they consider the price of original software to be reasonable. However, lowering the prices of original software might discourage software developers in their research and development. It is difficult to expect software developers to reduce their prices to deter people from software piracy.

Heavier punishment for people using pirated software might help because this would increase the cost for people using pirated software. For example, Hong Kong computer users can now buy a pirated Microsoft Office program for HK\$100 whereas the original Microsoft Office is selling at HK\$2,000 on the market. Although many laws and policies against software piracy have been created in the past two decades, strict enforcement is still difficult. If the punishment for software piracy is greater than the actual cost of original software, computer users might be less likely to consider its pirated version to be a cheaper alternative.

From a commercial perspective, software developers can try to control software piracy using different marketing strategies. In fact, they should treat pirated software as their competitors. Shareware can be one possible option for software developers to compete with pirated software. Technological solutions against software piracy, such as using product keys and cryptography against illegal copying, can help to stop the piracy problem, and such techniques are commonly used in the software industry. However, this option cannot be used in competition with pirated software unless the cost of breaking the protection devices is far more than the cost of the original software. Alternatively, software developers can provide some discounted packages for those users who cannot afford the original software—for example, by offering some low-price education licences for students and academia.

To conclude, solving the problem of software piracy is no simple matter. An effective approach to combat software piracy involves changes in

social attitudes, changes in marketing strategy of software developers, and changes in individual conscience and attitudes to intellectual property protection. Education and law enforcement alone will not solve the entire problem. Software piracy is a complex problem requiring many approaches if it is to be solved.

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