Chapter 9

Why Do We Do It If We Know It's Wrong? A Structural Model of Software Piracy

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This study examines predictors of software piracy, a practice estimated to cost the software industry nearly $11 billion in lost revenue annually. Correlates with software piracy were explored using responses from a university wide survey (n=589). Forty-four percent of university employees reported having copies of pirated software (mean = 5.0 programs), while 31 percent said they have made unauthorized copies (mean = 4.2 programs). A structural model, based in part on the theory of planned behavior (Ajzen, 1985) and the theory of reasoned action as applied to moral behavior (Vallerand, Pelletier, Cuerrier, Cuerrier & Mongeau, 1992), was developed which suggests that social norms, expertise required, gender, and computer usage (both home and at work) all have direct effects on self-reported piracy. In addition, ease of theft, people's sense of the proportional value of software, and various other demographic factors were found to affect piracy indirectly. Theoretical as well as practical implications for the design and marketing of software are discussed.

INTRODUCTION

If dollar estimates are correct, software piracy rivals organized crime as one of our nation's most costly offenses. Although scholars are far from agreement on the level of legal protection that should be afforded software and other forms of

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intellectual property (Nelson, 1995) and engage in considerable debate regarding the actual costs of software piracy (Masland, 2000), most researchers agree that piracy is widespread. Industry surveys estimate that for every legitimate copy of software, there are between two and ten illegal copies (James, 2000; Conner & Rumelt, 1991). In some studies, over half of those surveyed admitted that they had made unauthorized copies of computer software. Even in the more conservative business arena, estimates suggest that in the US 25% of all installed applications are pirated. The Business Software Alliance (1999) estimates that, worldwide, the industry is losing nearly $11 billion annually in lost revenue. In the US alone, lost sales are estimated at $2.8 billion, plus a loss of over 100,000 jobs, amounting to $4.5 billion in wages and $991 million in tax revenues.

Beyond the economic impact, studying software piracy is important for other reasons. First, it may help us better understand how social norms and moral standards develop for new technologies, especially technologies involving intellectual property issues. Second, research on software piracy may expand the important philosophical debate on intellectual property. A central controversy in this debate is that many of the owner's rights commonly associated with tangible property are not violated when intellectual property is copied or used by others. Further, many philosophers and economists contend that intellectual property rights should not be protected by law (Davidson, 1989), arguing the such protection is anticompetitive, monopolistic, and can stifle creativity and progress (Abbott, 1990; Cooper-Dreyfuss, 1989; Davidson, 1989; Samuelson, 1989; Wells-Branscomb, 1990). The many proponents of stronger copyright and patent protection argue that property rights should be strictly enforced, claiming that piracy is an insult to hardworking inventors and essential to foster innovation in one of the largest value-added industries in the world (Schuler, 1998). A final reason for studying piracy behavior, and an important theme of this book, is that understanding society's norms and values regarding piracy adds to our understanding of social responsibility in the information age, which has widespread implications for design and marketing in the software industry.

THEORY AND MODEL DEVELOPMENT

Software piracy has been investigated from varied disciplinary perspectives, including: (1) economics (Gopal & Sanders, 1998; Bologna, 1982); (2) those that attempt to deter or detect would-be offenders (Holsing & Yen, 1999; Jackson, 1999; Sacco & Zureik, 1990); (3) as a risk-taking phenomenon (Parker, 1976); (4) or simply by the failure of society's morals to keep up with the growth in technology (Johnson, 1985). Much of the empirical research on software piracy has focused on ethical and legal aspects (Im & Koen, 1990) while a few studies have dealt with the social costs (Briggins, 1998; Conner & Rumlet, 1991; Mason, 1990), or attitudes (Reid, Thompson & Logsdon, 1992; Sacco & Zureik, 1990; O'Brien & Solomon, 1991; Taylor & Shim, 1993). While these studies offer some insight into various motivations to pirate, a more encompassing and plausible model for software piracy has yet to emerge. An important aim of this chapter is to develop a model that both predicts and explains incidents of software piracy.

We begin by examining previous studies that report correlates of software piracy behavior and computer use. Recognizing that the act of piracy may hinge on moral, ethical or attitudinal concerns, we turn next to several popular theories of reasoned action for guidance. Finally, to ensure that the model generalizes to a broader class of items deemed intellectual property, we examine several important aspects that distinguish tangible from intellectual property. The model that emerges integrates previous research on correlates of piracy behavior and a rational action perspective on moral behavior with several defining characteristics of software and other forms of intellectual property.

Computer Usage and Demographic Factors

Earlier research aimed at understanding software piracy approached this behavior as a dimension of computer use or, more specifically, misuse. Sacco and Zureik (1990) found that piracy was the most frequently reported misuse of computers, with 62% of respondents reporting that they had made illegal copies of software. Respondents also reported that they believed a great deal of illegal copying was going on, and that the likelihood of detection (getting caught) was very low. Previous research that examined personal and/or demographic factors has yielded mixed results regarding the relationship between gender and software piracy. One study found a significant relationship (O'Brien & Solomon, 1991), while another study (Sacco & Zureik, 1990) did not. The effects of age and computer use have also yielded divergent levels of software piracy across studies. In addition, studies have found that software pirates are generally bright, eager, motivated, and well qualified (Parker, 1976). These are the same characteristics we value in people, and beg the question: Are we trying to predict software piracy or good citizenship? Thus, a more definitive relationship between demographic variables and software piracy remains an empirical question.

Morality, Ethics and Reasoned Action

Several studies have examined software piracy with a moral or ethical focus. Im and Van Epps (1991) see piracy as yet another sign of the moral decay in corporate America. To combat the problem, they offer three prescriptions centering on educating employees concerning what is acceptable and unacceptable behavior. Swinyard, Rinne and Kau (1990) argue that many people weigh the outcomes or benefits of illegal copying more than the legal concerns of getting caught. Their results also indicate that morality judgments likely differ by culture or national origin, adding yet another dimension to be addressed in our understanding of software piracy. Although the two studies mentioned above offer somewhat different perspectives on piracy, both point toward morality and ethics and important considerations for any theory of software piracy.

Although important, theories of morality and ethics are not sufficient for developing a predictive model of piracy behavior. Here we turn to the theory of reasoned action (Fishbein & Ajzen, 1975) and two important extensions: the theory of planned behavior (Ajzen, 1985) and the theory of reasoned action as applied to moral behavior (Vallerand et al., 1992). A central feature in the theory of reasoned action is the individual's intention to perform a given behavior. Intentions capture the sum of an individual's motivational influences; they are indications of planned effort or of how hard one is willing to work to perform a behavior. Accordingly, there are two main determinants of intention: a personal or "attitudinal" factor and a social or "normative" factor. Attitude, in this context, refers to the favorable or unfavorable evaluation of behavior. It is a function of the salient beliefs one holds regarding the perceived consequences of performing a behavior and the evaluation of these consequences. Social norms consist of a person's perception of what important referent groups think he or she should do. These subjective norms are often determined by normative belief structures and motivations to comply with the behavior. Therefore, when attitudes and subjective norms coincide there is a greater intention to perform the behavior.

The hypothetical independence of attitudinal and normative factors has been seriously challenged by research showing significant correlations between these constructs (Miniard & Cohen, 1981; Ryan, 1982; Shephard & O'Keefe, 1984). These findings are particularly interesting because they suggest that either a common antecedent exists, or one's normative beliefs causally affect one's attitudes. Causality questions take on added importance when the behavior in question has moral implications.

Vallerand et al. (1992) extended the basic rational action perspective by incorporating moral behavior. They contend that a person's normative beliefs, i.e., what important others may view as appropriate behavior, are common determinants of an individual's attitudes and subjective norms. Therefore, when confronted with a moral situation, such as software piracy, individuals decide on the basis of their attitudes toward the behavior (determined in part by the probabilities and consequences of getting caught) and their perceptions of what important others (e.g., parents, other relatives, friends, professors) think is appropriate. This view is similar to differential association, a "learning" theory of deviant/criminal behavior, that suggests we adopt attitudes favorable or unfavorable to deviance based partially upon the acceptance of the attitudes and behaviors of esteemed others with whom we interact or observe (Sutherland, 1947; Akers 1994).[1]

A somewhat different configuration of measures leading to behavioral intentions is derived from a theory of planned behavior (Ajzen, 1985), however, they retain, largely, the same meaning outlined above. Attitudes, subjective norms, and perceived behavioral control are proposed as theoretically independent determinants of intended behavior. The latter concept represents the perceived difficulty of performing the behavior based upon past experience and anticipated barriers or hurdles (e.g., time, skills, cooperation of others; see Ajzen, 1985, for a more complete discussion). The relative importance of these concepts in predicting behavioral intention is expected to vary across behaviors and populations. However, generally, as attitudes and subjective norms become more favorable and the level of perceived behavioral control increases, the intention to perform a particular act should become more likely.

Modeling Conceptual Differences in Software and Intellectual Property

The theories and extensions outlined above provide an important framework from which to examine software piracy. However, due to important conceptual differences, a theory of software piracy or a more general theory covering intellectual property may differ in certain respects to reasoned action theories. Consistent with reasoned action theories both attitudinal and social factors are expected to be important determinants of piracy. People make bootlegged copies of software, music, or VHS tapes with little regard for the legality of copyrights or patents. The awareness that others are doing it can help establish a social norm that software piracy is acceptable. Among computer users, for instance, general agreement that software is overpriced or that copying is appropriate when the original software was purchased may lead to widespread approval of software "sharing" without any remorse.

If, as past research suggests, a moral component of software piracy exists, then personal attitudes and social norms are likely to be determined by common antecedents. Thus, a model of software piracy should include certain exogenous factors, such as age, income and employment, that serve to shape one's normative beliefs. These normative beliefs, in turn, are important determinants of both attitudes and subjective norms. Yet, little guidance exists regarding how such a perspective might be empirically modeled.

Additionally, perceived behavioral control is expected to play an important role within this integrated perspective. Software piracy requires certain skills and expertise, as well as opportunity. If the required abilities are beyond an individual's perceived control, software piracy is not likely to emerge. Thus, level of expertise (perceived behavioral control) is expected to have a direct effect on piracy

METHOD

Thus far we have identified likely predictors of software piracy and suggested a possible temporal order for many of the variables. To test these conjectures, a questionnaire was designed that captures computer use and demographics using several single-item measures, and proportionality, ease of theft, social norms and expertise required with four multi-item measures. After appropriate pretesting, the survey was conducted and the data analysis submitted to structural equations modeling (specifically, LISREL). This technique has been used in a variety of research domains in the behavioral and social sciences and is well suited to test relationships between single and/or multi-item measures where temporal order remains important. We begin by describing the sample, survey design, and procedure.

Sample

The study was conducted at a large southwestern university. The sampling frame was a mailing list of 9550 names purchased from the university that included everyone on the university payroll, from high level administrators to full-time gardeners and part-time graduate students. In total, 1910 surveys were distributed to a random sample of employees. Of the total distributed, 589 surveys were returned (gross response rate of 31%). The study excluded 66 respondents who did not report microcomputer use (17 respondents did not answer questions concerning their microcomputer use, and 49 respondents reported they did not have access to a microcomputer either at home or at work). Thus, the final sample included 523 returned surveys from university employees who reported some microcomputer use.

The respondents represent a wide cross section of employees. Approximately 42% were classified staff, 20% faculty, 18% professional staff, 12% graduate students, and 8% administration. Men and women were equally represented (49% versus 51%, respectively), with an average age of 39.7 years old and a median education level of a college degree.

Survey Design

The survey was divided into three sections. The first section contained questions addressing general aspects of computer use: frequency of computer use, types of computer use and software applications, access to personal computers, and purchases of software. This section also contained three questions concerning self-reported piracy behavior, as well as a question concerning perceptions about the frequency of piracy among computer owners.

The second portion of the survey addressed attitudes and perceptions regarding unauthorized copying of software. Multi-item scales were developed to measure proportionality, social norms, expertise required, and ease of piracy. Response categories were 7-point Likert scales where 1 is "strongly disagree" and 7 is "strongly agree."

Nonexclusivity (nonexclusive nature) was measured by comparing responses to two questions: 1) It's alright to take home up to $25 worth of company office supplies, and 2) It's alright to copy company software that costs as much as $25. Although the dollar amounts were chosen arbitrarily, the distinction between tangible and intangible property is clear. Further, the questions were spaced to impede deliberate comparison. If the arithmetic difference between the two responses was positive, the respondent felt it was more acceptable to take home an unauthorized copy of company software than it was to take home company office supplies that have similar value. If the arithmetic difference was zero, this is an indication that the respondent sees no difference between these actions.

The third section of the survey contained the standard demographic questions of age, education, gender, religious affiliation, employment status, and income.

Procedure

The survey was pretested among select faculty, staff and graduate students. After some modifications, the instrument was distributed through campus mail to a systematic random sample of employees. As software piracy is a controversial topic, underreporting of piracy was a concern. To address this concern, the cover letter assured complete anonymity. To enhance response rate, everyone who received the initial questionnaire was sent a follow-up postcard two weeks later which asked them to respond if they had not already done so.

RESULTS

Descriptive Statistics

Of the employees surveyed, 44% reported that they have received unauthorized copies of software from friends or relatives. When asked "how many copies," the mean response was 5.0 programs (sd = 1.30). Thirty-one percent of those surveyed said that they have made unauthorized copies. When asked "how many copies," the mean response was 4.2 programs (sd = 1.32). When asked to estimate what percent of microcomputer owners have unauthorized copies, the mean response was 66% (sd = 8.30). Several questions were asked regarding the respondent's level of computer experience. Only 49% of those surveyed said they had taken two or more formal computer courses. Yet, 88% reported that they use a PC at work. Of these, 83% reported more than two years experience. Word processing (91%), spreadsheet (46%), and email (41%) were the most frequently

Table 1: Means, standard deviations, skewness and kurtosisof measurement model indicators

	Indicator Variable	Mean	SD	Skewness	Kurtosis	
1.	Overpriced: (Software is)	2.78	(1.46)	0.480	-0.336	R*
2.	Profitable: (companies developing software are)	2.63	(1.37)	0.600	-0.117	R*
3.	Value: (compared to other goods software is a)	3.94	(1.46)	-0.091	-0.221	
4.	Fairly priced; (software is)	3.35	(1.44)	0.109	-0.334	
5.	Obtained: (PC owners can easily obtain unauthorized software)	5.06	(1.49)	-0.540	-0.191	
6.	Installed: (Unauth. Software is easily)	4.83	(1.48)	-0.446	-0.010	
7.	Copies Made: (It is easy to copy unauthorized software)	5.41	(1.42)	-0.872	0.594	
8	Needs: (It's alright to copy software for bus./prof.)	2.69	(1.75)	0.938	-0.088	
9.	Workcopy: (It's alright for employees to copy company software costing $25)	2.26	(1.59)	1.301	0.935	
10.	Copy: (It's alright to copy microcomputer software)	2.89	(1.73)	0.707	-0.341	
11.	Permission: (It's wrong to copy software without)	2.64	(1.77)	0.988	0.012	R*
12.	Borrow: (Copying software is more like borrowing than theft)	2.73	(1.70)	0.751	-0.383	
13.	Friends: (It's wrong to copy software obtained from a friend)	3.25	(1.92)	0.492	-0.883	
14.	Personal: (It's alright to copy software for personal use)	2.99	(1.83)	0.583	-0.710	
15.	Make: (After purchasing software it is okay to copy it for friends)	2.90	(1.75)	0.629	-0.575	
16.	School/work: (It's wrong to copy software obtained from school or work)	2.89	(1.83)	0.730	-0.502	R*
17.	Computer Knowledge: (People would purchase if they did not have knowledge to copy)	3.85	(1.96)	0.149	-1.180	
18.	Computer Skills: (People making copies possess special skill)	2.98	(1.63)	0.622	-0.355	

NOTE: Items scored 1=strongly disagree, 7=strongly agree. Items marked with an (R*) were reverse scored to coincide with the remaining items in the factor.

cited applications. Using a PC at home was reported by 58% of the respondents. Word processing (95%), games (48%), and spreadsheets (44%) were the most common home uses. When asked if they have ever purchased PC software, 62% said yes. Of those that own or have access to a PC at home, 86% reported purchasing software.

Indicators of the Measurement Model

The 18 indicators presented in Table 1 were employed to operationalize a measurement model of software piracy perceptions that ranged from computer knowledge required to social norms surrounding the unauthorized use of software. As outlined in the table, the survey questions crossed employment, social, and personal boundaries where software piracy may occur. Indicator variables were collected using seven-point Likert scales, with four variables (overpriced, profitable, permission and obtained) reverse scored. For a more detailed discussion of the indicators, including a discussion of skewness and kurtosis, see the appendix.

Empirical Assessment of the Measurement Model

In exploratory analyses not shown here, several additional factors of deterrence, or detectability, and nonexclusivity were included. However, these factors were found to have no empirical basis. Further, the single indicators of deterrence and nonexclusivity were found to be unrelated to software piracy and are not included in the structural model. Several indicators were also eliminated from the

Figure 1: Measurement model: Software piracy perceptions

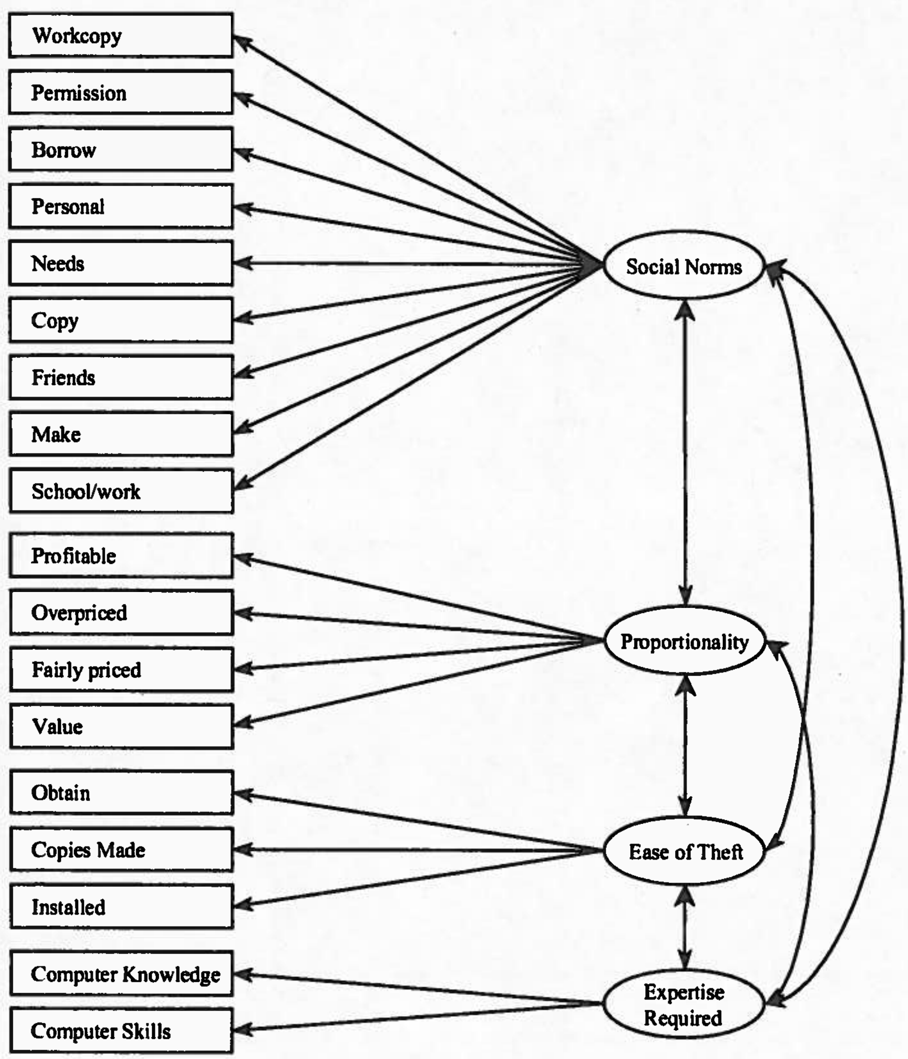


Table 2: Comparison of relative fit statistics for measurement and structural models of software piracy

	Model Description	Chi-square Statistic	D.F.	Differences In Fit	Differences In D.F.	X2/df	GFI	
Measurement Models								
1.	18 indicators, 4 latent factors, no error correlations.	369.20	129	----	----	2.862	.922	
2.	12 error correlations allowed between indicators tapping similar perceptions.	157.11	117	212.09**	12	1.343	.968	
Structural Models								
3.	Simultaneous est. of meas. and struc. models. Direct effects from exogenous measures.	464.13	313	----	----	1.483	.950	.288
4.	Introduce direct effects from measurement structure.	464.13	313	no change				.411
5.	Delete direct effects from several demographic measures.	473.04	323	8.91	10	1.465	.949	.402
6.	Delete direct effects from proportionality and ease of theft factors.	474.83	325	1.79	2	1.461	.949	.413
7.	Add direct effects from proportionality to social norms and easy to knowledge.	480.24	327	5.41	2	1.468	.948	.413

Probability level: *<.05; **<.001.
Note: Models 5, 6, and 7 are significantly improved due to the additional degrees of freedom saved by altering the direct effects allowed in the model structure. GFI is the goodness of fit index provided by LISREL.

analyses since they did not sufficiently cohere to their assumed latent structures, social norms and expertise, or the remaining factors in the model.

Figure 1 depicts the measurement model relating to software piracy perceptions. Proportionality, for instance, represents an unobserved construct that generates the structure of relationships among its indicators--overpriced, profitable, value, and fairly priced. Each indicator is a linear combination of the latent measure proportionality, plus a random measurement error component. The initial model estimated assumes that these measurement errors are uncorrelated with the latent unobserved construct or with one another. The program computes asymptotically unbiased and efficient maximum likelihood estimates of parameters, as well as a likelihood ratio statistic that approximates a chi-square distribution in large samples.

Table 2 presents chi-square statistics and other relative fit comparisons for a model of software perceptions and piracy. As expected, the baseline model does not fit the data well ($\times^2$=369.20; d.f.=129; ratio=2.862; GFI=.922). In relatively large samples a general rule-of-thumb is that the chi-square/d.f. ratio should be less than 2.0 and the goodness of fit index (GFI) should exceed 0.95. While the results

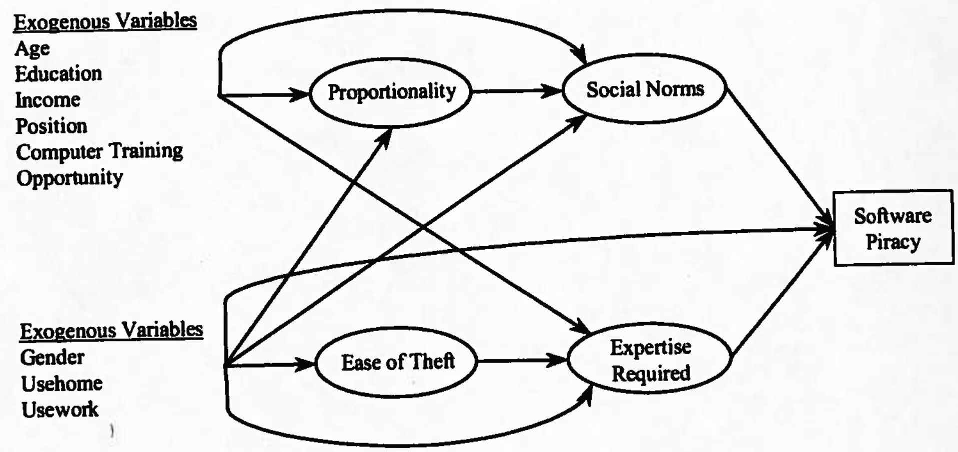
Table 3: Measurement model of software pirating perceptions (N=523; chi-square=157.11; d.f.=117; GFI=.968)

Indicator Variable	Proportionality		Ease of Theft		Social Norms		Expertise Required	
Overpriced	1.000 [0.953]	(0.000)						
Profitable	0.393 [0.397]	(0.049)						
Value	0.575 [0.552]	(0.058)						
Fairly Priced	0.746 [0.722]	(0.064)						
Obtained			0.662 [0.542]	(0.064)				
Installed			0.874 [0.719]	(.0730)				
Copies Made			1.000 [0.860]	(0.000)				
Needs			0.794 [0.709]	(0.043)				
Workcopy					0.722 [0.712]	(0.039)		
Copy					0.805 [0.730]	(0.042)		
Permission					0.717 [0.635]	(0.048)		
Borrow					0.753 [0.696]	(0.042)		
Friends					0.684 [0.557]	(0.052)		
Personal					1.000 [0.856]	(0.000)		
Make					0.940 [0.837]	(0.040)		
School/work					0.647 [0.556]	(0.049)		
Computer Knowledge							0.595 [0.500]	(.177)
Computer Skills							1.000 [0.809]	(0.000)
Reliability		0.7672		0.7409		0.9013		0.4328

Note: Maximum-likelihood coefficients reported first. Standard errors reported in (), standardized solution reported in brackets. GFI is a goodness of fit index provided by LISREL.

from Model 1 approach the GFI threshold, they do not approach the appropriate ratio. However, this is largely because error correlations were not allowed between the observed indicators in the model. A review of the 18 indicators suggests that many of them tap similar beliefs, perceptions, or ideas even though they are not perfect replications of one another. Therefore, in Model 2 twelve error correlations are included, although the basic four-factor structure depicted in Figure 1 is retained. As expected, the fit of Model 2 is a dramatic improvement over Model 1 (ratio=1.343; GFI=.968). While other structural configurations were examined,

Figure 2: Structural model of software piracy



none were found to fit the data as well as Model 2. For instance, the latent factors of expertise and ease of theft might appear to overlap by looking at the indicators of each; however, the correlation between these structures is only .375. In addition, analyses combining the five indicators under one factor yield a reduction in the number of degrees of freedom but a large decrement in the chi-square statistic. Therefore, the four-factor structure is retained.

Empirical Assessment of the Structural Model

Due to its highly technical nature, a more detailed discussion of the empirical assessment of the structural model can be found in the appendix. This discussion tracks systematic changes to the proposed model and the resulting measures that assess goodness of fit. A summary description of this empirical assessment is provided in Table 2. Briefly, LISREL analysis was performed on 18 indicator variables comprising four latent factors. Various causal effects from both the latent factors and error terms were then systematically added or removed, and the resulting models, seven in all, were tested for relative goodness of fit. No improvement was possible from Model 6, which is displayed in Figure 2 and discussed next.

A four-factor structure was retained in Model 6. Four indicator variables (overpriced, profitable, value and fairly priced) loaded on the proportionality factor (see Table 1 for a more detailed description of the variables, and Table 3 for the maximum-likelihood coefficients and standard errors). The reliability measure was 0.7672. Four indicators (obtained, installed, copies made, needs) also loaded on ease of theft, with a reliability measure of 0.7409. The social norms factor was comprised of eight indicator variables (workcopy, copy, permission, borrow,

Table 4: Parameter estimates of structural model predicting software piracy (X2-480 .24, d. f.=327, GFI=.948)

	Endogenous Measures				
Predetermined Variables	Proportionality	Ease of Theft	Social Norms	Expertise Required	Software Piracy
Age	0.019	-0.024	-0.030	0.013	
	[0.154]*	[-0.025]	[-0.205]**	[0.179]*	
Sex	0.271	0.257	0.038	-0.082	0.310
	[0.100]*	[0.104]*	[0.012]	[-0.054]	[0.143]**
Education	0.091	0.053	0.079	-0.132	
	[0.064]	[0.041]	[0.048]	[-0.165]*	
Employed	0.015	0.029	-0.004	-.0013	
	[0.071]	[0.149]	[-0.017]	[-0.111]	
Income	0.038	0.096	-0.052	-0.045	
	[0.052]	[0.143]*	[-0.060]	[-0.108]	
University Position					
Admin.	0.334	1.260	-0.154	0.700	
	[0.063]	[-0.259]**	[-0.250]	[0.232]*	
Class. Staff	0.112	-0.487	-0.215	0.235	
	[-0.040]	[-0.192]	[-0.067]	[0.150]	
Prof. Staff	0.138	-0.471	0.142	0.327	
	[0.039]	[-0.147]*	[0.035]	[0.165]	
Faculty	0.001	-0.413	0.312	0.429	
	[0.000]	[-0.136]	[0.080]	[0.228]*	
Computer Experience					
Training	0.162	0.015	-0.092	-0.103	
	[0.123]*	[0.012]	[-0.060]	[-0.138]	
Home Use	0.044	0.003	0.019	-0.059	0.035
	[-0.155]*	[0.013]	[0.058]	[-0.366]**	[0.155]*
Work Use	.0002	0.040	-0.006	-0.035	0.034
	[-0.006]	[0.106]*	[-0.012]	[-0.152]	[0.103]*
Opportunity	0.094	0.217	0.248	0.034	
	[-0.096]	[0.240]**	[0.215]**	[0.061]	
Factors					
Proportionality			-0.316		
			[-0.271]**		
Ease of Theft				-0.263	
				[-0.426]**	
Social Norms					0.252
					[0.366]**
Expertise					-0.427
					[-0.301]**
R-squared	0.117	0.204	0.273	0.683	0.413

Note: Standardized coefficients in [ ]. Significant effects: *p <.05; **p < .001.

friends, personal, make and education) and yielded the highest reliability measure at 0.9013. Finally, two variables (computer knowledge and computer skills) loaded on expertise required. The reliability measure, 0.4328, is much lower than the three previous measures, but fairly typical of two-item measures.

Table 4 presents the maximum-likelihood and standardized coefficients for the model depicted in Figure 2. The final column of this table depicts the five direct effects on software piracy. Men are significantly more likely to pirate software than women as are those individuals who report using computers in their home or at work. In addition, those individuals who agree that using unauthorized software is not really theft are significantly more likely to do so than their contemporaries. Of these five direct effects, the standardized coefficients suggest that the strongest effects come from social norms and expertise. Therefore, the relatively high r-squared is largely the result of a person's perceived norms relating to computer software usage and expertise with computers.

Of the four factors in the model, only social norms (sc = 0.366, $p < 0.001$) and expertise required (sc = -0.301, $p < 0.001$) were found to have significant direct effects on reported software piracy. The positive standard coefficient (sc) on social norms indicates that the more one views piracy as acceptable, the more one is likely to engage in this behavior. Similarly, the negative standard coefficient on expertise required suggests that the greater the perceived difficulty of making illegal copies, the less likely the behavior. Proportionality affected software piracy indirectly through social norms (sc = -0.271, $p < 0.001$). This result suggests that the greater the perceived proportional value of software, the less likely one is to view piracy as acceptable. Ease of theft also affected software piracy indirectly. The significant direct effect on expertise required (sc = -0.426, $p < 0.001$) indicates, as common sense would predict, that as the perceived ease of making illegal copies increases, less expertise is required to pirate software.

Turning next to the exogenous variables specified in the model, age was positively related to proportionality (sc = 0.154, $p < 0.05$) and expertise required (sc = 0.179, $p < 0.05$) and negatively related to social norms (sc = -0.205, $p < 0.05$). This suggests that, as we pass our twenties, we are more likely to appreciate the proportional value of software and the expertise required to make illegal copies, and less likely to condone piracy behavior. We also found significant effects for gender, with males more likely to view piracy with greater proportional value (sc = 0.100, $p < 0.05$) and ease of theft (sc = 0.104, $p < 0.05$) and more likely to engage in self-reported piracy (sc = 0.143, $p < 0.001$).

Interestingly, computer experience worked in opposite directions. Formal training in computers was positively related to the perceived proportional value of software (sc = 0.123, $p < 0.05$), but using a computer at home was negatively related (sc = -0.155, $p < 0.05$). Increased home use of computers also lowered impressions of the expertise required to pirate software (sc = -0.366, $p < 0.001$) and had a positive and direct effect on self-reported piracy (sc = 0.155, $p < 0.05$). The opportunity to pirate software was positively and highly significantly related to both the ease of theft factor (sc = 0.240, $p < 0.001$) and social norms (sc = 0.215, $p < 0.001$). This indicates that those with a greater opportunity to pirate software view the action as less difficult and more acceptable.

DISCUSSION

Microcomputer software is protected under US Code, Section 17, of the copyright law (Mason, 1990). Although the maximum penalties for copyright infringement have recently been increased, results from this and other studies confirm that a high proportion of people believe the behavior is permissible. Thus, empirical research or theory that begins by assuming software piracy is universally accepted as inappropriate behavior fails to recognize the attitudes and evaluations

Starting from this vantage point, our research makes several contributions to the study of software piracy, ethics, and technology. First, the results support and extend those of previous studies concerning piracy behavior. A sizeable proportion of the respondents reported incidents of piracy, which is consistent with previous research (O'Brien & Solomon, 1991; Sacco & Zureik, 1990). Our results also indicate that gender affects reported piracy behavior, with males more likely to pirate software than females. However, while age has been reported in some studies as having direct effects on piracy, our findings indicate that age is related to piracy behavior indirectly by significantly affecting three of the four endogenous factors making up the measurement model.

Second, by modifying the theories of reasoned action (and the Vallerand et al. extension applied to moral behavior) and planned behavior, the present investigation had a firm foundation on which to develop a model of software piracy. The factor representing social norms, for instance, is the strongest predictor of pirating behavior. Although survey questions addressed both attitudinal (personal) and normative (social) criteria, separate factors failed to emerge. This finding coincides with those studies (Miniard & Cohen, 1981; Ryan, 1982; Shephard & O'Keefe, 1984) that challenge the independence of the attitudinal and normative factors. Further, we also identify several antecedent variables that are likely to affect an individual's normative beliefs and, in turn, their social norms. In agreement with the theory of planned behavior, we find that perceived behavioral control (expertise required) has an important direct effect on self-reported piracy.

Third, certain conceptual distinctions characterizing software and other forms of intellectual property were investigated. One's perception of proportional value was found to be indirectly related to software piracy. Proportionality was negatively related to social norms; that is, if individuals perceived the price of software to be unfair they were more likely to report social norms in favor of software piracy. To our knowledge, this was the first attempt to investigate the concept of software as nonexclusive property. We operationalized the construct as the difference in an individual's attitude towards the theft of tangible versus intellectual property. The greater this perceived difference, the more likely the individual was to report social norms in favor of software piracy. Nonexclusivity, although found to be positively related to social norms, did not survive the model construction phase of our analysis. Thus, future investigations should develop a variety of means by which to investigate this concept since it would seem to have a common-sense relation to deviant behavior.

Understanding the attitudes and perceptions of those who pirate software may point toward those areas holding the greatest promise for solutions. For example, if people copy software because the price violates their sense of proportional value, software firms may consider two solutions: raise the perceived value of the product through marketing efforts or lower the price (Zeithaml, 1988). Similarly, if existing social norms are contributing to the growth in unauthorized software, several remedies are available to software manufacturers. Two such solutions include (1) changing the image offenders have of the industry through a public relations campaign or (2) encouraging institutional customers to develop software policies which discourage unauthorized copying. To our knowledge, software associations have not considered this first alternative. They are, however, actively engaged in the second. Software associations are hard at work, both in and out of court, to establish standards and guidelines for their institutional customers. Interestingly, our results suggest that part of this effort may be misguided. We find no relationship between awareness of employer's software policies and reported piracy. Similarly, Taylor and Shim (1993) also report no relationship. Reid et al. (1992) found no relationship between awareness of copyright law and unauthorized copying. However, before we can confidently exclude such policy considerations from the model, a more in-depth analysis across different institutions, particularly nonacademic institutions, is required.

Companies that develop commercial software applications must carefully consider the issue of copy protection. Protection methods, which range from dongles to key diskettes and access codes, complicate the product, add additional cost, and may require added support. However, when done correctly, the company may reap the rewards from increased sales of its product. Advice on copy protection methods generally touch on several points, including choosing a method that is difficult to "crack," simple to apply, requires a minimum amount of technical support, and does not involve special manufacturing techniques.

It's important to point out that this model is an individual-level one, which only tangentially addresses many of the important macro-level issues of software piracy. One of the primary issues concerning intellectual property involves whether legally protecting it encourages or stifles innovation. As one scholar argues, "The fundamental bargain made for either patent or copyright protection is disclosure to the public in return for a monopoly of either limited duration (for patents) or limited scope (for copyrights) (Davidson, 1989, p. 163)." The debate is far from resolved in favor of protection. Conner and Rumlet (1991) conclude that not protecting software may, paradoxically, increase profits while lowering the cost for the consumer. Pirates may actually create a market for a particular type of software by making it the operating standard in a particular organization or industry. While the piracy model reported here does not directly address the merits of legal protection, it certainly makes clear that consumers do not view software piracy the same as theft of tangible goods, regardless of whether such activity is illegal or against company policy.

A related debate concerns the ability of legal standards to actually protect intellectual property from unauthorized copying. For example, software piracy is much more prevalent in foreign countries with weak legal protection of intellectual property rights (Weisband & Goodman, 1992). An interesting area for future research would be a cross-cultural examination of attitudes and behavior regarding software piracy in countries with varying legal protection (Swinyard, Rinne, & Kau, 1990). Such research would be particularly illuminating if it were longitudinal. As many countries adopt stricter intellectual property laws in order to comply with international trade standards, we could measure how legislation affects social norms regarding intellectual property.

There are several concerns that must be addressed before generalizing these results to other populations or other types of intellectual property. First, piracy was self-reported. Though we promised anonymity, we still could not ensure that all respondents were truthful. Second, attitude and value scales are difficult to validate and may have limited reliability (Grosof & Sardy, 1985). Third, there may be non-respondent bias; respondents may have been less likely to copy software than non-respondents. These concerns are somewhat allayed by the fact that the frequency of reported software piracy was quite high. Furthermore, ethical and legal concerns make it unfeasible to observe participants actually copying software illegally during an experiment. Thus, in spite of their weaknesses, surveys such as this one play an important role in the study of sensitive topics such as software piracy. The model proposed here is not meant to be definitive. It needs to be refined and tested with other populations as well as other types of intellectual property. The current research is meant to be a starting point for further work in this important and developing area.

ENDNOTE

1. We raise this link with deviance research since the behaviors investigated with such perspectives are similar to software piracy in value of the item stolen (criminologists often ask whether individuals have taken anything less than $50) and seriousness of the crime (seriousness remains a vague concept but is often used to rank order level of criminal activity).

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APPENDIX

Indicators of the Measurement Model

The multi-context character of the survey, even though it remains a cross-sectional design, is significant since it affords the opportunity to empirically distinguish whether some of these perceptions pertain only to work/personal settings or are more general in nature. In addition, Table 1 presents information on the distributions of these 18 measures. The measures of skewness and kurtosis do not appear to evidence any dramatic departure from normality (Hayduk, 1987). Nevertheless, methods of analysis that do not require that all assumptions of multivariate normality are have been conducted and are referred to below.