Schools of Thought in Software Piracy Research

Research-in-Progress

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ABSTRACT

The unauthorized copying of computer programs, referred to as software piracy, continues to be a major threat to the security of the digital assets of software publishers. Software piracy has received much attention from researchers, often from different perspectives, or schools of thought. As a first step, we have reviewed the articles on software piracy in Information Systems journals, classified them into major schools of thought, and summarized the findings of each school. We briefly show that a comparison of findings from multiple schools of thought can facilitate triangulation of results. Our comparison also points to the need for further clarification of some issues. In future work, we will include articles published in journals of other disciplines, and develop an integrated view of the software piracy phenomenon to support our efforts to propose a holistic approach to reduce software piracy.

Keywords:
Software piracy, intellectual property theft.

INTRODUCTION

The protection of digital assets from unauthorized access is at the heart of the field of security. Thus, the software industry’s struggle to protect its products from unauthorized copying constitutes one subset of the area. Unauthorized copying, use, and distribution of software, commonly referred to as software piracy, is an ongoing problem that has not found an easy solution. According to 2009 statistics developed by the Business Software Alliance, there is an annual revenue loss of over $50 billion throughout the entire industry (Chan and Lai, 2011; Moores and Esichaikul, 2011). It is estimated that the average worldwide piracy rate is 41%, and that for every two dollars customers spend on legally obtaining software products, one dollar’s worth of software is acquired illegally. In addition, the top three pirating countries of China, Vietnam, and Ukraine all have rates in excess of 90% (Douglas, Cronan, and Behel, 2007).

The technical defenses against software piracy have been found to be wanting (Athey and Plotnicki, 1994; Conner and Rumelt, 1991; Gopal and Sanders, 1997). It is generally accepted that behavioral and social approaches need to complement technical approaches to find ways to reduce software piracy – one could loosely say that a socio-technical approach is needed. Research has viewed the phenomenon of software piracy from diverse perspectives, but each article used only a single lens (e.g.: behavioral, ethical, economic), and examined software piracy at both individual and country levels of analysis. However, no significant attempt has been made to integrate findings from these diverse approaches, nor has a holistic approach to fighting software piracy been suggested. We have embarked on a research project to do a comprehensive literature review on software piracy, integrate the findings across different approaches, identify possible avenues of future research, and search for holistic approaches to reduce software piracy. In the current article, we report interim results, based on a review of the published findings in the Information Systems literature. At this stage, our goal is to integrate findings, and identify consistencies and conflicts in the research. Attempts to identify holistic, theory-based approaches to fight software piracy will be addressed in later stages of our research.

More specifically, in this article, we classify published literature into various schools of thought. For each school of thought, we identify the premise of the research, summarize key findings, and then provide a brief critique. In the process, we surface some of the consistencies and conflicts across studies, which point to the need to address certain research questions to better understand the phenomenon of software piracy.

The rest of the article is organized as follows. The schools of thought are discussed in the next section. In the conclusion, we offer a few examples of conflicts and consistencies across schools of thought.
THE SCHOOLS OF THOUGHT

Our first goal is to identify the schools of thought present in the research on software piracy. We searched major scholarly databases (e.g.: EBSCO, ProQuest, Google Scholar) to identify the relevant articles. For the current effort, we limited ourselves to those published in Information Systems journals. The resulting sixty-three articles were classified into the different schools of thought¹. Future research will include articles from journals in other academic disciplines.

After reviewing the articles, four overarching schools of thought were identified. The schools of software piracy in the Information Systems literature are behavioral (which includes ethical), protection, economics, and global culture. A description of each school of thought is provided below:

- The behavioral school includes articles that examine individual characteristics and external factors that influence piracy behavior. The ethics school is considered a subset of the behavioral school. It addresses research that examines the moral factors that influence software piracy.
- The protection school addresses articles that relate to techniques to control and reduce piracy.
- The economics school adopts a rational approach, which balances the losses attributed to piracy against the benefits derived from the network externalities associated with piracy.
- The global perspective examines cross-national differences in piracy behavior.

<table>
<thead>
<tr>
<th>School of Thought</th>
<th>Number of Articles</th>
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<tbody>
<tr>
<td>Behavioral</td>
<td>31</td>
</tr>
<tr>
<td>Protection</td>
<td>15</td>
</tr>
<tr>
<td>Economics</td>
<td>15</td>
</tr>
<tr>
<td>Global</td>
<td>12</td>
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Table 1. The Number of Articles in Each School of Thought

Most articles fell into one category. When an article could be classified in more, they were included in each of the categories. Table 1 shows the number of articles in each category. Figure 1 shows the number of articles that are classified in more than one category.

¹ Due to word limit, only articles cited in the text have been included in the References. The complete list of all 63 articles is available upon request.
Figure 2 shows the number of articles published by year for each school of thought. This gives us an idea of the progression of relative interest in each school of thought. For instance, interest in protection was higher in the pre-2000 years. In contrast, interest in the behavioral school was higher in the post-2000 years. Admittedly, this is the level of interest in the school for researchers in the IS discipline.

In the following sub-sections, the major premises and findings of each school is discussed, along with a brief critique.

The Behavior School

Premise and Findings of the Behavioral School

The premise of the research in the behavioral school is to examine individual factors that influence software piracy. Christensen and Eining (1991) and Solomon and O’Brien (1990) were the first to address factors affecting the attitudes toward software piracy.

Within the behavioral school, the factors studied can be classified into four sub-groups: demographics, cost/affordability, ethical beliefs, and deterrence. The results of the studies for each set of factors are discussed below. Before the discussion, it is worth mentioning one key point: much of the research relies on self-report data. They include surveys, which query the respondent’s piracy behaviors, and experiments, in which the subjects respond to the likelihood that they will engage in piracy under different controlled conditions. Responses under these circumstances are prone to social desirability bias. Surprisingly, social desirability bias has not been addressed in piracy research, with the exception of the work done by Kwan, So, and Tam (2010) and Woolley and Eining (2006). In order to measure the honesty of respondents, they implemented randomized response technique. Woolley and Eining’s results indicated that respondents answered questions truthfully, while Kwan et al. found that individuals were more willing to disclose sensitive information when using the method. Social desirability bias can be a significant issue when assessing levels of piracy; however, for current analysis, the results are accepted as reported.

Demographics: Key demographic factors that have been examined are: age, gender, and technical proficiency. Studies show that younger individuals pirate more (Woolley and Eining, 2006). Moores and Dhillon (2000) and Woolley and Eining (2006) also confirm the typical software pirate as male. Siponen and Vartiainen (2005) extend this conception by connecting gender differences in behavior to the underlying attitudes towards piracy. They conclude that while significant
differences exist in piracy behavior, there is no difference in attitudes between genders. Further confirmatory evidence of differences in piracy behaviors across genders has been reported by Cronan, Foltz, and Jones (2006). In contrast, Pearson, Crosby, and Shim (1997) found that gender does not affect an individual’s likeliness to pirate software. Also, evidently, software piracy requires some level of technical proficiency. It has been shown that expertise to pirate does influence piracy behavior (Hinduja, 2003; Seale, Polakowski, and Schenider, 1998).

Awareness and social norms are factors that can reflect individual behavior as well. It has often been argued that a lack of awareness of computer piracy laws may be the reason for the high levels of unauthorized copying. Woolley and Eining (2006) showed that while respondents’ knowledge of software piracy laws had increased between 1991 and 2006, the rates of piracy had not decreased correspondingly, thus refuting the explanatory role of the lack of awareness. But it has been shown that individuals who receive legal training participated less in piracy (Gopal and Sanders, 1998). This raises the interesting question of the differences between awareness of copyright laws and legal training. Authors have also reported that social norms are often correlated to the level of software piracy (Cronan et al., 2006).

Cost/Affordability: Several studies have shown that there is a positive correlation between the cost of software and piracy (Moores and Dhaliwal, 2003; Moores and Dhillon, 2000; Siponen and Vatiainen, 2007). The cost of software is reflective of two constructs — affordability and fairness. At a personal use level, Moores and Dhillon (2000) have shown that affordability of software may influence piracy. Further, Moores and Esichaikul (2011) have established that even when software is for work-related purposes, the ability to pay is often a reason to pirate. Douglas et al. (2007), who based their work on equity theory, found that software producers’ fairness towards users has a significant impact on user piracy behavior. It should be mentioned that some studies on cost and affordability are not precise in their definition and measurement of the constructs, leading to the inability to state clearly whether it is affordability or fairness that influenced the likelihood of piracy.

Ethics: The ethics sub-category in the behavioral school of thought discusses individuals’ belief in codes of ethics, ethical decision-making processes, and moral intensity.

Mason (1986) wrote a seminal paper on the major ethical issues in Information Systems. Among the four issues that he discussed, the author included problems associated with intellectual property theft and software piracy. However, the role of ethical values in software piracy is unclear. For instance, Pearson et al. (1997) found that ethical variables have no effect on an individual’s likelihood to pirate software. In contrast, Thong and Yap (1998) concluded that ethical judgment influences piracy behavior. They also determined that the intent to pursue piracy was determined by both deontological (adherence to rules) and teleological (weighing of outcomes) ethical evaluations. Also, Kini, Ramakrishna, and Vijayaraman (2003) found that moral intensity towards software piracy was a function of age, gender, and technical expertise. Moores and Chang (2006) also determined that software piracy is determined by ethical judgment, but found differences based on age, not gender.

Deterrence: The ineffectiveness of deterrence in software piracy has been largely accepted. For instance, Konstantakis, Palaigeorgiou, Siozos, and Tsoukalas (2010) deem that most users pay little attention to laws, finding them unrealistic and inapplicable. Others agree that software piracy poses minimum risk, and is further facilitated by the ease of pirating (Moores, Nill, and Rothenberger, 2009; Siponen and Vatiainen, 2007). However, some researchers continue to find support for the role of deterrence. For example, Moores et al. (2009) argue that the fear of legal ramifications is the primary motivating factor against an individual’s attitude towards piracy.

Critique of the Behavioral School

The key issues that emerge from a review of the behavioral school are:

- Social desirability bias has not been addressed adequately in the research. Such biases may be a source of error in the studies.
- The aggregated findings of gender present a complex picture. Moral intensity towards software piracy and piracy behavior seem gender dependent. However, the gender differences in the underlying attitudes towards software piracy do not suggest this.
- Explanations of software piracy based on the cost of software do not distinguish clearly whether affordability or fairness is the underlying reason that higher costs lead to higher piracy rates.
- The role of ethical values in software piracy also presents challenges. Studies suggest differing results on whether ethical values affect software piracy behavior. Additionally, there is a belief that unauthorized copying of software is ethical, and the origin of this needs examination.
• Attempts to deter software piracy have mostly been accepted as relative failures. It is true that studies indicate that effective deterrence could reduce software piracy. However, the reality is that while the necessary laws are present, certainty of detection, prosecution, and punishment are minimal. Barring some new mechanism or technology to detect and prosecute unauthorized copying, deterrence holds little prospect.

The Protection School

Premise and Findings of the Protection School

Published literature in this school focuses on a study of the methods available to safeguard the intellectual property rights of software publishers. In particular, it addresses issues related to legal and technical protection. Legal issues pertain to the options of establishing software ownership, along with the advantages and disadvantages of each. Technical protection refers to the use of technology to prevent copying. It is interesting to note that after an initial flurry of publications in the 1990s, the issue of protection has received little attention in IS literature.

Beginning with Graham in 1984, many authors circumscribed the major legal avenues available for software companies to protect their assets. Authors prescribe a ‘cocktail’ of trade secrets, copyrights, and patents to keep products secure (Forester, 1990; Gopal and Sanders, 1997; Graham, 1984; Koen and Im, 1997). However, some researchers believe that legal protection is not effective in eliminating piracy. Reid, Thompson, and Logsdon, (1992) posit that additional legal restrictions would not alleviate the problem, as the obstacle is not based on ignorance or lack of communication of the law. The weakness is the ability of legal authorities to enforce the law effectively.

Some authors posit that technically protecting software is the ‘best policy’. For instance, Coldwell (1998) and Maude and Maude (1984) suggested that the best way to prevent piracy is through encrypting software uniquely for every customer. Suhler, Bagherzadeh, Malek, and Iscoe (1986) agreed with this notion and stated that validation and physical copy protection were also necessary. However, Athey and Plotnicki (1994), Conner and Rumelt (1991), as well as Gopal and Sanders (1997) disagree. The authors believe that by not protecting software, selling prices would decrease due to less programming efforts, and overall profits would increase due to positive network externalities. Athey and Plotnicki (1994) believe that technical solutions to halt piracy have failed, and that educational efforts regarding the benefit of purchasing legal software constitute the final frontier of protection.

Critique of the Protection School

The lack of interest in the protection school among IS researchers may lie in the fact that while legal and technical protection are necessary, they are not sufficient to eliminate software piracy. Laws are in place to prohibit unauthorized copying, but neither the means nor the will appears to exist to enforce the laws. Thus, the research potential in the area of legal means of protection is minimal. The furtherance of the technical protection is more in the domain of computer science than in the field of Information Systems. Thus, it is not surprising that the interest in this school among IS researchers has declined.

A point worthy of note is that while neither legal nor technical protection has been successful, they will have to be a part of any holistic plan to reduce overall software piracy.

The Economics School

Premise and Findings of the Economics School

The economics school of thought focuses on understanding that revenue loss due to software piracy must be balanced with costs from protection and the benefits of network externalities. Interest in the area has grown significantly in the 2000s, and appears to be continuing thusly. Although the majority of economic research centers on modeling, behavioral analyses have been sporadically incorporated (Gopal and Sanders, 1997).

The economics school has its roots in the counterintuitive findings of Conner and Rumelt (1991): that piracy can be beneficial to software publishers. Subsequently researchers have shown that software piracy is not always beneficial (Lahiri, 2012).

Research in the economics school has shifted over time from overarching ideas to niche security methods. August and Tunca (2008) discussed the issue of software patching for illegal users. Among their conclusions, the authors found that generally it is in the producer’s best interest to restrict security patches to legal consumers; however, in the presence of low patching costs, it might be optimal to have unrestricted patch access. Hui, Yoo, and Tam (2008) and Jaisingh (2009) found that piracy tends to decrease software quality. Kwan, Jaisingh, and Tam (2008) determined that the protection of software products is
only viable if the cost of the protection mechanisms to the developer is small. Also, in the face of piracy, Liu, Cheng, and Tang’s (2011) research recommended price-skimming strategies (setting a relatively high price initially, then lowering it over time).

Critique of the Economics School
The idea that software piracy may be beneficial to the software publisher under certain conditions is intriguing. The challenge is to go beyond Conner and Rumelt’s (1991) initial study to identify the specific conditions under which piracy is beneficial to the publisher and the conditions under which it is not. The body of research on software piracy in the economic school appears scattered. A cogent program of research is necessary. Further, the models make key assumptions to generate results. The value of this effort would be greatly enhanced if the models could be validated with data from the real world.

The Global Culture School

Premise and Findings of the Global Culture School
The global culture school of thought includes articles that compare piracy behavior across countries. Only research in which the authors conducted a cross-country comparison are included (as opposed to studies simply examining software piracy in a single country other than the United States). Research in this area was active in the 1990s and early 2000s, but has petered out since then.

Goodman (1991), and Weisband and Goodman (1992) were among the first to address the global culture stream. They believed that piracy was widespread in developing countries because their citizens had little respect for intellectual property rights. The extent of piracy is further aggravated by the ease of duplication and little risk of punishment. Also, few U.S.-based software companies protected their products legally outside the United States (Malhorta, 1994).

It is generally accepted that piracy rates vary across countries, ranging from about 35% in the U.S. and some of Europe to over 90% in nations like China, Thailand and Russia (Douglas et al., 2007; Gabella and Picasso, 1995). Several factors have been identified which could explain the differences in piracy rates across countries. These include: the state of the software industry in a country, gross national product (GNP), collectivism, and governmental corruption. Gopal and Sanders (1998) argued that countries in which the software industry was not well established had weak laws and enforcement mechanisms, presumably to give the domestic software companies ability to gain a foothold in the market. They suggested that alliances between foreign and domestic publishers might increase copyright enforcement. Through this, governments can enhance the welfare of their country, and help establish a strong domestic software industry. In a different study, Gopal and Sanders (2000) determined that piracy is much more pronounced in countries with per capita GNPs of less than $6,000. This resonates with studies at the individual level, arguing that affordability of software is a factor in explaining piracy levels. Bagchi, Kirs, and Cerveny (2006) and Davenport (2000) have argued that that piracy could also be due to moral differences, not just income level. They have shown that countries with lower corruption rates had lower piracy rates. Still, others have proposed that cultural differences can explain differences in piracy rates. Bagchi et al. (2006) and Shin, Gopal, Sanders, and Whinston (2004) found a significant positive relation between collectivism and software piracy. While each of these explanations has empirical support, no clear attempt has been made to either integrate these results into a single explanation, or to determine which of these factors is/are more important than the others.

Interestingly, Dakin defended the practice of software piracy in developing countries by claiming that if piracy were to be enforced more strictly, non-industrialized nations would lose access to software to a large extent because they would not be able to afford the U.S.-based pricing. This would further increase the digital divide. Hood (2005) seems to accept the inevitability of global software piracy, arguing that local low-income governments will do whatever is necessary in order to develop.

Critique of the Global Culture School
There is a general acceptance of the inevitability of software piracy all over the world. But even the most cynical players concede that piracy rates of 90% are beyond the pale. Researchers have provided empirical support for several explanations, but practical ways to reduce piracy remain elusive. Governmental agencies have little motivation to expend resources to prohibit behaviors primarily affecting foreign companies. The differences in affordability across countries suggest differential pricing as a way to reduce piracy. Nevertheless, this is difficult to implement. The correlations of piracy to governmental corruption and collectivism enhance theoretical understanding of piracy levels, but do not point to any practical solutions.
CONCLUSION

Interesting issues emerge when findings from two or more schools of thought are compared. We provide three examples to illustrate the value of such comparisons. First, the economics school suggests that a certain level of piracy can be beneficial to the software publisher. The behavioral school has shown that social influence affects piracy behaviors. Thus the danger in publicly tolerating a level of piracy is that the tolerated piracy behavior forms the core to socially influence others into engaging in unauthorized copying of software. Second, the global culture school suggests that lax deterrence measures are responsible for the high level of piracy in some countries. However, the behavioral school provides evidence that deterrence is not an effective remedy. Thus, it seems that piracy levels are more likely due to other reasons. Third, the cost of the software has been suggested as a possible factor in explaining software piracy both by the behavioral and the global culture schools. This triangulation of results increases the credence of the role of cost.

Finally, in our opinion, the solution to the problem of unauthorized copying of software requires a combination of social, legal, ethical and technical approaches. The goal of our research is to integrate published results to develop a socio-technical approach to reducing software piracy. In the current article, we present our work-to-date. We have organized the published articles in the Information Systems journals into schools of thought, and critiqued the work in each school. Our next step will be to include the results published in the areas of computer science, ethics and economics to enrich the discussion. Through this, we aim to examine if additional schools of thought exist, and to seek a holistic view of the phenomenon as a precursor to outlining a solution to the problem.

REFERENCES