Alleviating piracy through open source strategy: An exploratory study of business software firms in China

T. Pykäläinen a,1, D. Yang b,2,*, T. Fang c,3

a Department of Economics and Business Administration, University of Jõensuu, P.O. Box 111, FI-80101 Jõensuu, Finland
b Department of Business Administration at Trinity University, One Trinity Place, San Antonio, TX 78212, United States
c School of Business at Stockholm University, SE-106 91 Stockholm, Sweden

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ABSTRACT

This paper advances the existing knowledge of anti-piracy strategies by proposing an open source strategy (OS strategy) to alleviate software piracy based on a qualitative, case-based, exploratory study of eight software firms operating in China. The paper shows that the OS strategy is conditionally adoptable, depending on how users are willing to pay for services (market conditions); how critical and complex software is required for upgrading and modifications (software conditions); and how firms can avoid resources overloading and/or shortage (firm conditions). The paper also identifies several new indicators to assess the effectiveness of the OS strategy against piracy. Managerial implications about how to improve business in piracy-ridden environment are discussed.

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1. Introduction

Software piracy refers to unauthorized copying of software, using one license to install more than an allowed number of licensed copies and/or purchasing illegal copies of software (Prasad and Mahajan, 2003; Tang and Farn, 2005). In the software industry, free distribution, modification and copying of proprietary software is prohibited and considered piracy being unauthorized reproduction (Barton and Nissanka, 2001; Prasad and Mahajan, 2003; Tang and Farn, 2005). According to Business Software Alliance (BSA, 2007: 1), “[F]or every two dollars’ worth of PC software purchased legitimately in 2006, one dollar’s worth was obtained illegally”. The piracy rates across the world ranged from 21% to 95% with over half of the countries with a piracy rate of at least 60%. The BSA predicts that this global problem will continue to affect the industry, as the commercial value of the pirated software is estimated to hit US$180 billion by 2010. Software piracy is particularly rampant in developing countries and emerging markets where intellectual property (IP) protection (IPP) is yet to be enforced properly (Gopal and Sanders, 1998). For example, piracy in China presents ‘daunting challenges’ for business managers (Yang,
The prevalence of software piracy warrants the need for researchers to seek effective strategies against it and for practitioners to adopt those strategies to secure business success. Prior research shows that anti-piracy strategies can be preventive or deterrent (Gopal and Sanders, 1997). Within preventive measures, for example, technological solutions are used to increase the costs of engaging in piracy whereas deterrent means aim to reduce piracy by creating a threat or fear of sanctions (op cit). However, the effectiveness of these measures can be compromised when firms are limited by funds and other resources. Moreover, deterrent control in the form of technical copy protection "fails in protecting application software from being illegally copied" (Djekic and Loebbecke, 2007) due to sophisticated counterfeiters breaking through incremental technological barriers (Yang, Fryxell, Sie, 2006). Therefore, searching for new anti-piracy strategies with improved effectiveness has become an unending task for both research and practice.

This qualitative, case-based research explores a new anti-piracy strategy – open source strategy (henceforth “OS strategy”). We define OS strategy as a strategy that the owners of IP rights adopt to allow users to get free access (under license) to an IP-embedded software product and all or some of its code. We have gained insight for our formulation of OS strategy from the Chinese concept of winning a war without fighting. The Art of War, the world’s earliest treatise on strategy written by Sun Tzu 2300 years ago says: “To win one hundred battles is not the acme of skill, but to subdue the enemy without fighting is” (Fang, 1999: 158). Extending Sun Tzu’s philosophy to the current research setting, the OS strategy should be able to help prevent software piracy without directly confronting the pirate, given that free access to the software leaves no room for the existence of piracy.

We have also gained insight for this research from the concept of Open Source Software (henceforth “OSS”) that gives users the rights to modify, copy and distribute software freely (Krishnamurthy, 2003). OSS differs from proprietary software in the treatment of software source code in that it is freely redistributable while the proprietary software is not (West and Gallagher, 2006). Intuitively, OSS seems to be working against the concept of IPP: its products may be seen as opposing the idea of IP, as they are given away. One may even go as far as to see OSS as the enemy of IP: for example, Linux has been called a ‘cancer’ (Greene, 2001). Nevertheless, like proprietary software, OSS also comes with licenses (Krishnamurthy, 2003), of which some, such as BSD, grant the software to be used for proprietary software development while some other licenses (e.g. GPL) guarantee the openness of derivative works (Krishnamurthy, 2003; West, 2003). As a result, OSS developers create IPP (Pykäläinen and Fang, 2007) and depending on the types of license (OSS vs. proprietary) granted, users are given (or denied) certain rights of usage or distribution associated with the software. The open source approaches promote value creation through collective intellect (Chesbrough and Appleyard, 2007) to offset costs and short product life cycles (Chesbrough, 2007), thereby challenging the traditional way to rely on proprietary technology (Pykäläinen, 2007). In reality, most firms do not follow the pure OSS model, but adopt a hybrid business model (Bonaccorsi, Giannangeli, Rossi, 2006). That is to integrate products, licenses and sources of revenues to assess the degree of openness on a case by case basis so as to succeed with maximized effectiveness. Given the hybrid nature of OSS, can it help firms to counter the prevalent piracy? This question leads us to our current research.

With the aim of exploring the OS strategy in mind, this paper intends to answer two research questions: First, how and under what conditions can OS strategy be adopted to prevent piracy? Second, how can the effectiveness of OS strategy against piracy be indicated? We have adopted a qualitative, case-based research to explore these two research questions, and focus on the software industry due to its high exposure in piracy (Husted, 2000). Case study approach is appropriate for this research because it aims to address ‘how’ and ‘why’ questions concerning contemporary events, over which the researchers have no control (Yin, 2003).

The remainder of the paper is structured as follows. Section 2 addresses the strategies available against software piracy and identifies the need for this research. Section 3 discusses methodology. Section 4 presents the findings. Finally, the paper discusses the results and provides implications and future research directions.

2. Strategies against piracy

2.1. Existing strategies against piracy and strategic effectiveness

Table 1 summarizes the strategies for IPP or against piracy and how these strategies to different extent alleviate piracy in a preventive or deterrent manner. Both preventive and deterrent controls can reduce piracy, but only deterrent controls have potential to increase profits (Gopal and Sanders, 1997). Preventive controls may reduce profits or may not work (op cit), as technical protection methods fail to protect software from piracy (Djekic and Loebbecke, 2007). Depending on the costs of the protection method and the product’s differentiation level (quality vs. features) from competitors, the firm may be better off not implementing any software protection strategies (Kwan et al., 2008). Lower quality products in a vertically differentiated market should adopt a non-protection strategy, whereas in other cases, firms could adopt protection if the implementation costs are relatively low (op cit).

Despite these strategy recommendations, merely two studies appear to have tested strategy effectiveness – i.e. how successful each strategy is against piracy. Yang, Fryxell, Sie (2006) investigated the perceptions of multinational managers in China about anti-piracy strategies’ effectiveness. Their findings show that anti-piracy strategies, including administrative
supports (government actions against piracy), judicial actions (civil or criminal proceedings against offenders) and corporate approaches (direct corporate actions against piracy) have some effect in curtailing piracy. However, when corporate approaches are taken, administrative supports and judicial actions become less effective, implying the superior strategic importance of corporate actions against piracy. This quantitative research also confirms Yang et al.’s (2004) case study findings that firms should combine different strategies to maximize anti-piracy effectiveness.

Lybecker (2007), using mathematical modeling, examined the effectiveness of preventive strategies against pharmaceutical patent counterfeiting in developing countries. Specifically, she examined the strategies – adopting new technologies, enforcement, monitoring supply chain and educating consumers and healthcare professionals – and their effect on the cost, value and enforcement of anti-counterfeiting measures. The conclusions reinforce Yang et al.’s findings (2006) that strategies are not all equally effective, but increasing penalties and securing the supply chain could reduce the amount of fakes on the market.

In spite of the strength of those strategies against piracy, it is worth noting their weaknesses. First, the effectiveness of these strategies seems unclear. There is a lack of empirical evidence about whether these strategies against piracy are effective. Although two studies (Yang et al., 2006; Lybecker, 2007) tested their effectiveness, the results are not definitive as to which strategy is better than others in tackling piracy. For example, pricing strategy may not work for high-tech firms due to high R&D costs and the high cost of marketing to increase product awareness (Yang, 2008). In the software industry, despite the availability of low price edition software, the pirated full featured product may still be much cheaper and more attractive than the low price legitimate product to some consumers. Second, lack of effective enforcement could render any well-defined IPP strategy obsolete. For example, China has a complete set of laws for IPP, but the key problem there is enforcement (Fernandez and Underwood, 2006; Lu, 2007). Under such IP environment, Microsoft, a strong advocate of IP, has learned to loosen its policies after its IPP failed in China (Kirkpatrick, 2007). Microsoft’s pricing strategy that has worked in developed countries did not seem to work well in China due to the limited enforcement of IP laws.

Third, the majority of customers – the ‘bottom of the pyramid’ (BOP) population (Prahalad, 2005) in developing countries, may not afford to pay even discounted IP products. Fundamentally, the supply of pirated products responds to consumer demand levels, which are increased by the price gaps between authentic and fake products (Yang, 2008). This demand by the BOP population is taken advantage of by manufacturers and suppliers of fakes to make quick profits from low prices by not having to pay for R&D, design, and promotion costs. In reality, the prices of innovative or branded products are often out of reach for the BOP because they reflect both innovating and manufacturing costs, not manufacturing costs alone (Bosworth and Yang, 2006). Purchasing pirated products thus provides a kind of subsidy to poorer consumers on realizing their materialistic goals. Therefore, strong IPP may not guarantee more sales and may even weaken demand (Jain, 1996) – piracy is still increasing in many markets despite increasing availability and sophistication of copy protection and digital rights management (DRM) technologies (Sundararajan, 2004).

### Table 1

<table>
<thead>
<tr>
<th>Author (year)</th>
<th>Strategy</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harvey (1988)</td>
<td>Normative framework</td>
<td>Awareness: alert stakeholders; action: seek for business-media impacts and create a task force against piracy; assertion: enforce IP</td>
</tr>
<tr>
<td>Delener (2000)</td>
<td>The same as above</td>
<td>Extend the above to include monitoring and product modifications</td>
</tr>
<tr>
<td>Olsen and Granzin (1993)</td>
<td>Corporate strategy</td>
<td>Take the piracy matters into one's own hands due to enforcement difficulties</td>
</tr>
<tr>
<td>Gopal and Sanders (1998)</td>
<td>Firm alliance</td>
<td>Local and foreign firms jointly tackle piracy and emphasize government effort</td>
</tr>
<tr>
<td>Shultz and Saporito (1996)</td>
<td>High-tech and acquisition</td>
<td>High-tech labeling and piracy production acquisition</td>
</tr>
<tr>
<td>Jain (1996)</td>
<td>Marketing strategy</td>
<td>Marketing mix strategies against piracy</td>
</tr>
<tr>
<td>Chellappa and Shivendu (2005)</td>
<td>Optimal sampling strategy</td>
<td>Piracy losses are severe for products that do not live up to the hype, thus requiring deterrence investment</td>
</tr>
<tr>
<td>Peace et al. (2003)</td>
<td>Software piracy reduction strategy</td>
<td>Strategies against piracy should focus on attitude, norms, and behaviors that determine the intention of software piracy</td>
</tr>
<tr>
<td>Douglas et al. (2007)</td>
<td>Deterrent strategy</td>
<td>Equity perception is a deterrent to software piracy</td>
</tr>
<tr>
<td>Lu (2007)</td>
<td>Lead time advantage strategy</td>
<td>R&amp;D and advanced technologies kept in strong IP regions; old generation products in weak IP regions</td>
</tr>
<tr>
<td>Meyer (2001)</td>
<td>Strategy for Chinese piracy</td>
<td>Keep secret; speed up R&amp;D; protect technology transfer; education</td>
</tr>
<tr>
<td>Yang et al. (2004)</td>
<td>Toolkit of corporate strategies</td>
<td>Proactive actions, defensive weapons, and networking means</td>
</tr>
<tr>
<td>Yang et al. (2006)</td>
<td>Anti-piracy effectiveness</td>
<td>Administrative support, judicial actions and corporate approaches</td>
</tr>
</tbody>
</table>

**Notes:** This table provides a snapshot of different anti-piracy strategies due to their relevance to the OS strategy. Interested readers can refer to the references for detail.
2.2. Open source strategy (OS strategy)

The imperfections of the existing anti-piracy strategies suggest the need to search for new strategies against piracy (Yang, Sonmez, Fryxell, 2009). Prior research shows that the optimal level of tolerating piracy is not zero in the real world. For example, tolerating piracy can increase the speed of adopting a software product (Prasad and Mahajan, 2003); firms can exploit piracy and maximize profits (e.g. giving samples to legitimize pirate users allows firms to know their users through feedback (Prasad and Mahajan, 2003)). Another example is Microsoft taking advantage of network effects by weak protection and lobbying for future IPP (Peitz and Waelbroeck, 2006): users who are initially allowed to use pirated versions of Windows and Office adopt the software as a standard and return later as buyers of Microsoft’s legitimate versions of upgraded products (Piller, 2006). Microsoft has used this network effect to establish itself in developing countries and to fend off competitors (op cit; Kirkpatrick, 2007).

Open Source Software (OSS) is a growing trend in the software industry due to the benefits it yields. First, OSS positively impacts on economy and society (von Krogh and Spaeth, 2007). Because of the rising costs of technological development, global competition, short product life cycles and fast technological diffusion, firms have to look for alternatives for internal development (Steensma and FairBank, 1999). External sources of knowledge for innovation thus become more important than ever before (Lin et al., 2002; Linder et al., 2003). By building an OSS community of users, firms can acquire a larger market share and use OSS as a commercial weapon against competition or to protect a market (Fuggetta, 2003). Several firms have found that the OSS approach is a viable business model, as it provides better profitability and business strategies than software sales alone (Jesiek, 2003). OSS business involves services related to the software (Bonaccorsi and Rossi, 2003; Krishnamurthy, 2003), such as certification (Krishnamurthy, 2003), consulting (West, 2003), support (de Laat, 2005; West, 2003) and training (Krishnamurthy, 2003; West, 2003). The rationality and general suitability of OSS business models have been discussed in a number of studies (e.g. Economides and Katsamakas, 2006; von Krogh, 2003; Pisano, 2006; Pykäläinen, 2007), and we do not address them in this research.

Second, the openness challenges the traditional business model. Teece’s (1986) model that consists of appropriability regime, dominant design and complementary assets has been influential in analyzing the distributions of profits from technological innovation. However, this model has been challenged in the software industry by the emergence of OSS (Pykäläinen, 2007). Economides and Katsamakas (2006) pointed out that in competition between proprietary and open source platforms, the proprietary platform will dominate in both market share and profitability. However, a larger number of paid applications on the open source platform would result in a better social welfare of the industry than on the proprietary platform. Their equations may not explain the failure of several proprietary systems (e.g. OS/2, Beos, Unix based commercial systems were not discussed), but they did explain why Microsoft dominates operating system markets.

Third, by disclosing knowledge, firms can improve their reputation and increase the chances to get into innovation networks to access external sources of knowledge (Muller and Pénin, 2006). For example, IBM (2005) and Sun Microsystems (2005) have granted the OSS community the right to use many of their patents in OSS projects. Furthermore, OSS is also subject to licensing terms (e.g. Krishnamurthy, 2003; West, 2003). Thus, IPP and OSS can coexist: IP can protect the firms’ rights against competitors while OSS brings benefit to the community for free. The owner of IP can control the terms as to how and when to use IP and who is allowed using it. By granting a free access to selected patent portfolios, firms can signal goodwill. For example, being a good corporate citizen seems to credit firms for their corporate social responsibility, and “contributes to people’s trust and employees’ protection of the company” (Bruun and Bennett, 2003: 24), although open knowledge disclosure may need a long time to prove profitable (Muller and Pénin, 2006).

There are also business reasons behind the decisions of ‘donating’ patents for the use of community. First, only 50% of the patents are found valid when tested in court (Sherry and Teece, 2004). This does not seem earth-shattering, except that a minority of the patents generate most of the total income of patents (Scherer and Harhoff, 2000) and the higher the value of the patent is, the higher the incentive for others to invent around the patent or to challenge it in court (Hufker and Alpert, 1994). Chesbrough (2003: 54) therefore suggests that “companies would actually save money if they donated the patent and their subsequent maintenance costs) to some worthy institution”. As a result, OSS is becoming the ‘worthy institution’ to use the patent.

Second, developing countries may prefer lower levels of IPP than developed countries given that strong IPP tends to result in higher costs and prices, and limited availability of products (Jain, 1996). For example, the relative costs (accounting for the standard of living of the country) for a popular commercial operating system and an office suite licensed together could be as high as US$21,678 in China (Ghosh, 2003). As IPP is designed to give the owner temporary monopoly in a geographical location, strong IP enforcement in the market allows the IP owner to maintain the desired prices level. On the other hand, weak IP enforcement and the prevalence of piracy may create pressure to lower prices. This is evident from the actions of Microsoft away for free that is to relinquish a right to somebody else without charge (e.g. a donation of a patent to a
OSS development model may be suitable in some markets where traditional business models do not work (Fuggetta, 2003). For example, China’s software piracy rate exceeding 90% (BSA, 2007) seems to indicate the collapse of traditional business models and failure of anti-piracy strategies, and calls for a new vision in the software industry. Likewise, in markets where the general purchasing power is limited, the OS strategy, which is based on free OSS, could be suitable. Interestingly, OSS has been taken as an alternative for traditional software business in practice, but yet, as the literature review on piracy showed, it has not been studied as a strategy against piracy – in spite of the relationship between piracy and OSS indicating that countries with high piracy rates tend to have fewer OSS developers (Pykäläinen and Fang, 2007).

There is a similarity between piracy and OSS in that they usually do not generate revenue for the firm directly from the product itself. The causes for that differ, however. One difference is that while OSS software developers willingly give the software away, thereby gaining good social reputation and possibly a large customer base, software pirates taint the firm’s reputation and rock its customer base due to fear of viruses in pirated products. The other difference is that in piracy, software is distributed behind the developers’ back, while in OSS, users can be open about the usage and distribution of the software. Thus, while pirates of proprietary software may want to avoid all contacts with the software developer, in OSS users are welcomed to various interactions that may create business opportunities.

In summary, the use of the OS strategy against piracy rests on the following justifications. In BOP markets, product costs in relation to the income level are high, often limiting the number of customers, and piracy has been connected with the income level. In software piracy, production costs are close to zero and no sophistication is needed because software can be copied easily. There is evidence of firms adapting lax IP policies and benefiting from it, as alternative revenue sources can be sought. The OSS model may bring goodwill especially in developing nations (e.g. through low costs) and can lower the development costs and cut the copycat markets, as low costs of OSS take away the incentive to copy the products. Finally, existing strategies are imperfect to solve the problem of piracy. These grounded arguments prompt us to explore the OS strategy further to find out its feasibility against software piracy.

3. Methodology

3.1. Research design and sample characteristics

This paper is a qualitative, case-based, exploratory study in which we use secondary data analysis, interviews based on the experiences of interviewees and a two-stage design (Cooper and Schindler, 2006). Secondary data analysis enables us to critique prior research and justifies the need for proposing a new anti-piracy strategy. We have also conducted personal interviews with experienced managers who adopted anti-piracy strategies, including the OS strategy. Moreover, two-stage design takes care of identifying research questions, pretesting them and establishing a qualitative research protocol; and interviewing and analyzing accordingly to address research questions (Yin, 2003).

We chose both Chinese and Finnish owned software firms of various sizes in OSS and proprietary software businesses as our case study firms and made comparisons between them. The Finnish firms are active in doing software business in China, but have never been studied before concerning the topic here. Finland is a small open economy with limited domestic markets, and software firms from such markets are dependent on foreign markets to gain a larger user base (Bell, 1995, 1997; Ojala and Tyrväinen, 2006). The same is also true of other Nordic countries, but Finland has, in addition, been a pioneer for OSS. To give an example, Finland is the original home to Linux – the best known example of Open Source Software (Economist, 2004), which Linus Torvalds started as a university student (West and Dedrick, 2001). Another example of this is MySQL – one of the most popular OSS database engines, which was initiated by two Swedes and a Finn (Sun Microsystems, 2009).

Thus, Finnish firms are considered representative of foreign software firms in our research, given that they cannot ignore the large Chinese software market despite the piracy problem in the market. Specifically, these firms should be in ‘professional’ software business (i.e. software being used in firms and organizations) to be representative for our purposes. We focus on managerial personnel, such as CEOs and chief representatives as our interviewees, because, in the Chinese markets, they are responsible for corporate strategies. Potential interviewees with rich knowledge and experience in the professional software business were also included in the interviews.

We followed a well acknowledged research procedure (Easton, 1992) to select our case study firms. First, we screened software firm databases for interview. The sources included a member list of the Chinese OSS promotion union, an export funding agency and a list of firms in a software cluster in Finland. Then, we visited the firms’ websites, enriching our understanding about the corporate background to select firms for this study. Next, we contacted the selected firms via email or telephone to solicit personal interviews.

The following criteria were used to select the firms. The firms had to be either Chinese or Finnish firms in the professional software business and offering OSS or proprietary software. The reasons for such selection criteria were that these firms were
familiar with OSS; that we were able to compare OSS with proprietary business to see whether anti-piracy strategies in OSS differ from those in proprietary firms; and that the analysis of these firms would allow us to draw conclusions from different perspectives in piracy handling. As a result, we were able to conduct analyses in a comprehensive manner for an exploratory study based on the knowledge and experience from a variety of firms (Yin, 2003).

Based on the criteria, we selected eight firms (altogether 10 persons) for case studies. The firms included three Finnish owned firms (two proprietary software firms and one dual-license firm offering proprietary and OSS software depending on customers' needs) and five Chinese OSS firms. They were all familiar with the challenges OSS businesses face and had an in-depth understanding of the implications of piracy for their business. Given that the influence of piracy on OSS firms and their strategies against piracy have not been previously studied, our exploratory study can provide fresh ideas and establish foundations for future research. Keeping this in mind, case study approach appears to be appropriate, and allows us to investigate a contemporary phenomenon in a real-life context where the boundaries between the phenomenon and the real-life situations are blurred (Yin, 2003).

Table 2 summarizes the characteristics of the eight firms (Firms A–H) and those of the interviewees. These firms, some of which are leading firms not only in China but also in global markets, are diverse in terms of size, products, operations, and experience. We welcomed such diversity, as it allows for different firm representations (Yin, 2003). For example, in terms of firm size, our interviews involve both micro firms with 10 employees and multinationals with numerous employees and operations all over the world. The interviewees had work experience in the software industry ranging from 4 to 20 years. Their rich experience provided us with important data to explore the possibility of using the OS strategy against piracy. We considered these managers as experts. Interviewing 'experts' about the subject is the principal way to conduct exploratory research (Saunders, Lewis, Thornhill, 2007).

### 3.2. Interview question, pre-test, and data collection

We first asked questions about the two main research themes (Tukey, 1977) – feasibility and conditions. For example, in addressing the feasibility of the OS strategy, we asked the interviewees whether the OS strategy could be adopted against piracy and under what conditions it would be feasible. We also asked how they would measure the effectiveness of strategy against piracy and whether the OS strategy, in their view, could be effective against software piracy. We then asked why the OS strategy is/is not effective. In the end, we consulted the interviewees as to measures that would best indicate the effectiveness of strategies against piracy and the reasons behind.

The interview questions were pre-tested via email with an expert in a small software firm, who is experienced in both anti-piracy activities and OSS. His feedback confirmed the appropriateness of the interview questions. He also suggested rephrasing some questions, clarifying some wordings, and adding one more question for the interview. That question was proved appropriate by interviews.

The questions were open-ended to provide the interviewees with flexibility to respond in a way that was based on their knowledge and experience. All interviews were conducted by the first author in Beijing and Shanghai, where the case study firms were located. Each face-to-face interview took up to two and a half hours. All interviews were conducted in English, but sometimes Finnish and Chinese were used for the purpose of clarification. Prior to each interview, a list of interview questions was sent to the interviewees via email for preparation.

### 3.3. Analysis methods

We defined our unit of analysis as interviewees’ perceptions on the feasibility, conditions and effectiveness of open sourcing a product and selling services (i.e. OS strategy) as a preventive strategy against piracy. We prepared our analysis by following the framework in relation to our research purpose and research questions (Saunders, Lewis, Thornhill, 2007). Once
data were collected, we first categorized them into various themes and sub-themes. We subsequently conducted case studies of individual firms following the theme matching method (Yin, 2003) to identify and categorize relevant interview contents. The case studies allowed us to find out how each individual firm and interviewee(s) had addressed our questions. At the final stage of our analysis, we conducted a cross-firm synthesis to aggregate the findings. We used ‘featured syntheses’ (Hart, 1998) – synthesizing all the data in one table under a few common topics related to the research questions. For example, relevant interview data on the conditions of adopting the OS strategy were listed as column headings. Each firm’s response to the conditions were then compiled against the heading, including which condition an interviewee had discussed and felt strongly about. Based on such a compilation, we came up with a list of conditions. By further examination, we aggregated these conditions under three categories: market, firm and software conditions. This synthesizing process enabled us to draw conclusions as to how the OS strategy can be adopted.

3.4. Reliability and validity

Four criteria are often used to assess the rigor of case studies: internal, external and construct validities, and reliability (Gibbert, Ruigrok, Wicki, 2008; Yin, 2003). Internal validity examines the causal relationships that are relevant to the data analysis (Cook and Campbell, 1979; Yin, 2003). For internal validity, we carefully designed our research questions in line with our research aim. The responses were then carefully analyzed to achieve our research purpose. In addition, all the interviews were transcribed and validated by the interviewees. Specifically, after the interviews, we transcribed and summarized the questions and answers and then went back to the interviewees to correct any incorrect information, to clarify unclear answers and to add relevant new information. Construct validity refers to the extent to which a study investigates what it claims to investigate with an accurate procedure (Denzin and Lincoln, 1994). In this research, we present our research procedure and conducted an extensive literature review to support our arguments.

External validity addresses the generalizability of a particular theory. Given that this is an exploratory study, case studies can be a good starting point for theory building (Eisenhardt, 1989), 4–10 cases providing a good basis for an analytical generalization that aims to “generalize a particular set of results to some broader theory” (Yin, 2003: 37). We used a multiple case analysis of eight firms to serve this purpose. Finally, reliability refers to the extent that the research enables other researchers to reach the same conclusion(s) when conducting a replication (Yin, 2003). To this end, we have carefully preserved our case study database, from the written work to base materials, including original documents and synthesis notes.

4. Findings

This section presents our findings based on the analysis of the eight case firms. We start by introducing the eight firms, then we focus on the suitability of the OS strategy as an anti-piracy strategy, the conditions under which the OS strategy can work and the indicators for its effectiveness. The analysis results in addressing our research questions set out at the beginning of the paper.

4.1. Firms description

To aid understanding on the empirical background of this research, some descriptive information is provided here. Firm A, in our study, has based its business strategy on partner co-operation. In other words, OSS offerings enable partners to sell services, thus the OSS model is attractive for partners, who pay the authorization fee to Firm A. Firm A is not severely influenced by piracy since its customers are large firms that do not use pirated software. Firm B provides OSS solutions, consulting and implementation, and is a leading firm in its product category in China. Its main customers are western firms in China. Piracy is not a problem for its software because its offerings can be copied and distributed free under OSS licenses. However, piracy of its competitors’ products may limit its opportunities to provide services for a fee.

Firm C depends strongly on international markets as only about 5% of its total revenue comes from Finland. The firm is the market leader in its sector in China and the rest of the world, and its offerings are proprietary software. It relies on licensing and maintenance fees to generate income within China, but the revenues largely come from services across the world. Unlike for Firms A and B, piracy is a burning issue for Firm C in China. Firm D is also a leading firm in its sector in China and relies on software services to generate income. Its switch from proprietary software to OSS was partly due to the impact of piracy on the firm. Firm E is another firm offering OSS and a market leader in its sector in China. Piracy influences its business indirectly by taking away opportunities in the marketplace.

Firm F is a consulting firm representing several software firms from Finland in the Chinese market. The firm is the market leader in its sector in China and the rest of the world, and its offerings are proprietary software. It relies on licensing and maintenance fees to generate income within China, but the revenues largely come from services across the world. Unlike for Firms A and B, piracy is a burning issue for Firm C in China. Firm D is also a leading firm in its sector in China and relies on software services to generate income. Its switch from proprietary software to OSS was partly due to the impact of piracy on the firm. Firm E is another firm offering OSS and a market leader in its sector in China. Piracy influences its business indirectly by taking away opportunities in the marketplace.

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4.2. Feasibility of OS strategy against piracy and conditions for effectiveness

Our findings confirm that the OS strategy can be adopted against software piracy, but the interviewees have varied views of the conditions on which the OS strategy can be applied. Two executives were adamant about the effectiveness of the OS strategy against piracy. One of them is the Chinese CEO from Firm A. Firm A was previously selling proprietary software, but due to piracy, it made no profit and decided to open source its product. Its CEO suggests widening the adoption of the OS strategy based on the belief that OSS has “no cost, so it is good for customers... it is available on the Internet, so it is convenient for them”. Once customers choose OSS, the demand for pirated software diminishes. Now in the OSS business, the company is growing by offering its self-developed ERP software and generating income through services. As a result, “our advertising costs are very low and customers can be reached easily”. Firm A seeks to profit by partnering up with other firms to offer extensive services to end users. Thus, they are avoiding piracy that created problems for their business earlier on. Firm A’s CEO described its OS strategy against piracy as follows.

To protect the city from a flooding river, there are two main ways: [building] river bank walls and canals. It may not be a good idea to build river walls to protect the city from flooding because eventually the water may, anyway, rise over the wall. Instead it will be better to build a canal and let the river flow around. For piracy, the same strategy can be used. Traditional strategies, such as law enforcement, are like high walls, blocking the piracy problem. No matter what kind of law enforcement, users still need software. If the price does not go down, then users would use pirate software, just like the river would flood over the river bank walls. However, the OSS strategy can provide an alternative solution, re-employing that of the canals for the flooding river.

In line with Firm A’s executive’s view, Firm H’s general manager stressed that although OSS was not designed to combat piracy, it is more suitable for that purpose than existing anti-piracy strategies. He pointed out that OSS software is free and authentic and enables people to legally use software, thereby aiding in efforts eliminating software piracy.

Differing in their views from those of Firms A and H, the other firms believed that the OS strategy could be adopted but under certain conditions. Firm H held the view that the use of OSS is not to fight piracy; it has an effect against piracy, because it makes pirates irrelevant in the software industry, but how does one pirate free software? The manager from Firm D summarized somewhat a differing view: “OSS is not about zero costs and zero costs are not necessarily OSS. Companies will be combining things to find the balance. For example, Google is free, but it is not OSS. They get money from other sources – OSS is the same. So when you have an idea how to make money from other sources, then it is enough”. Similarly, the director from Firm F noted that as long as the firm has a suitable business model for OSS, then the OS strategy can work against piracy.

Based on the interviews, we find that, among the stated conditions, ‘market conditions’ are the ones that can make the OS strategy workable. The OS strategy would work well in markets where users are willing to pay for services, such as maintenance, as market characteristics influence the opportunities to sell services. For example, in China, service markets in the software industry are still immature and income often comes directly from products, as experienced by Firm C. As a result, the suitability of the OS strategy might be questioned in such a market. However, the effectiveness also depends on the software businesses of the industry, as noted by one of the interviewees. The director of Firm G emphasized that the OS strategy would be more suitable if solutions could be sold (e.g. services and training) and if the revenue source could be transferred from products to services. He admitted that this strategy probably works better ‘in Western countries’ due to their matured services sector. However, he was confident that emerging economies, like China, are in transition and are gradually putting greater emphasis on ‘competence’, ‘training’ and ‘services’. All these will help firms to adopt the OS strategy against piracy effectively with time.

Among the stated conditions in this research, we also identified ‘software conditions’. The OS strategy would be suitable against piracy for complicated, critical software systems, i.e. large software solutions, as this type of software requires after-sale services that customers rely upon. In return to these services, the firm generates income. In contrast, small software is easy to understand and requires almost no services – thus, it generates little or no income from services. A firm can use the OS strategy to build its business community quickly to get the developer and user base that is required for business success. A case in point is Firm D, a former proprietary software firm, which could not grow as expected due to piracy among other things. Since switching to the OSS business, it has grown rapidly and occupied 70% of the market in its business in China. The manager says that adopting the OSS model solved the firm’s ‘copyright problems in China’, and that the OS strategy against piracy works when a firm offers “services, and most of the income is from services they provide”. Similarly, the OS strategy works when software requires constant upgrading and specific modifications to satisfy the customer’s requirements or when the customer has more requirements than the basic version can satisfy. This was pointed out by Firms B and E. In order to make money and to combat piracy, software could be offered as a paid-for version for upgrading and a freely provided OSS version for those with higher requirements.

Finally, the OS strategy works ideally when ‘firm conditions’ are met. Large software development firms (in number of staff) might have a strong financial foundation, but the OS strategy may not be suitable for them, because at the beginning of an OSS business, there is no income from the product, and paying for all the developers may not make any business sense. Small firms, on the other hand, tend to offer OSS that are easily understood, thus no services need to be provided, according to Firm A’s manager. The OS strategy therefore seems to be most suitable for medium-sized firms, because they have the right ‘fit’ of resources to offer large software systems combined with services. Firm A, for example, when adopting the OS
strategy, had to lay off employees, reducing its number from over 100 to 20. Now it is gradually developing many partner relations to offer extensive end user services related to its open source ERP software. This finding is in line with the practice in Italy (Bonaccorsi et al., 2006) and Finland (Koski, 2005) where many open source firms are small-sized enterprises (e.g. with turnover <500,000 Euros).

4.3. Indicators of the OS strategy’s effectiveness against piracy

Our analysis suggests some direct and indirect indicators to assess the effectiveness of the OS strategy against software piracy. Interviewees were asked to express their views on how to measure strategy effectiveness against piracy. Thus, some of the indicators discussed below may not be restricted only to the OS strategy, but anti-piracy strategies as a whole. First, income and revenues were identified as important indicators (Firms A, B, C, G and H concurred in this). These indicators can be easily observed within a firm; income and revenues tend to be positively related to strategies against piracy.

Second, good reputation can also be seen as an indicator to measure strategy effectiveness against piracy. This is because good reputation generates goodwill. For example, OSS helped Firm A to become well-known, thereby increasing public awareness and the chances of reaching customers. To build up its reputation, the firm relies on providing its services with free software though at the price of generating no income and laying off workers in the first 2 years. However, with time, it has built a community (e.g. partners and end users) around its product. The firm has become well-known with its OSS business model, which offers its customers a new choice, OSS. This new choice has an advantage, over monopoly and pirates, in pricing and, over pirates, in after-sale services. The CEO was optimistic that the firm would continue to increase its already strong customer base and enhance its reputation through quality.

Third, the lowered development costs can also be accounted for, to some extent, as an indicator of effectiveness that may indirectly influence the profitability of the firm, thus providing a partial solution to the no-income problem. For example, Firm B noticed the reduction of its software development costs due to community support. Likewise, Firm H manager demonstrated that “OSS helped/helps to have a bigger development and testing community: the software got good quality because of the feedback the company got through the community”. The managers of Firms A and D could not agree more: it is difficult to get funding to develop new software, and product development is expensive (e.g. Firm A spent 7 years on developing a new product). High development costs become a huge barrier and a risk especially when the software is bound to be pirated. However, for open source, ‘existing software can be used’ for further development without costs. As a side effect, depending on the license, it is worth remembering that using existing OSS software may require the firm to completely reveal the ‘new’ product source code.

Fourth, the number of stakeholders (e.g. licensees and partners) can also be an indicator of success against piracy. One of the interviewees pointed out that measuring the reduction in that number may be more reasonable when the user base is limited (e.g. for specialized software) – it is easier to see the change, as a small change in the absolute number of licensed users can have a large influence in the proportional change. Apart from increased number of paying customers, it can be beneficial from two other viewpoints. On the one hand, the more customers the firm has, the less customers its competitor has, as pointed out by the manager from Firm D (the OS strategy can be very good at this). On the other hand, as some of the business models may rely on partner co-operation, the number of partners can be an effective indicator. As a case example, Firm A does its actual business through its partners: the partners can offer authorized services to end users related to the OSS product developed by the firm. Thus, increasing the number of partners will increase the firm’s income. As the CEO stressed, by developing OSS, the firm enables its partners to sell services without having to worry about piracy; this is attractive to them and enables them to make money: when partners make money, his firm makes money as well.

Related to the fourth indicator, some business models may target at increasing the number of users in order to subsequently increase the value of the firm. We take this ‘increased value of the firm’ as the fifth indicator of strategy effectiveness against piracy. Firm F manager advised its customers that a product can be given away for free when it is possible to collect detailed data of the users. As explained by the manager, user information data itself may become a valuable asset for the firm, thus, it may be worthwhile to give software away for free in exchange for information about users, especially if earlier strategy based on proprietary product alone has not brought sufficient growth for the firm. This is particularly relevant if the entrepreneur is aiming for selling the firm for the highest bidder. The increased value of the firm can be an indicator of any successful strategy and not necessarily only specific to the OS strategy against piracy.

Finally, an alternative indicator for the effectiveness of anti-piracy strategy is through the budgeted expenditure for software. Anti-piracy strategy is more effective if the ratio between software budget and total expenditure of the end user (be it a firm or a home user) gets higher. Firm C manager pointed out that its main customers are large firms with revenues exceeding 10 million Euros per year. These firms have yearly budgets for tangible products, but as far as software is concerned, there is no budget and they may still buy only one license to install many copies. Firm E, with a large number of government organizations as its customers, suggested measuring the anti-piracy strategy effectiveness through the ratio of software purchasing budget against the total government purchasing budget. This indicator enables one to identify government behavior in software purchasing and the general public’s consumption pattern, and differences between them. A high ratio between software budget and the total expenditures of the organization would indicate higher expenditure on software and thus lower piracy, which might subsequently impact on government’s attitude towards piracy. This indicator is suitable mainly for proprietary software, as with free OSS the ratio would become zero – low ratio would either indicate high OSS usage or high piracy of proprietary software. Nevertheless, ratio between software budget and total expenditure as
an indicator for the effectiveness of anti-piracy strategy has potential to be further developed into considering the role of budget in software services. Legislative requirements for large organizations (government and private firms) to publicize their actual expenditure for software in the previous year and the estimates for software in their IT budget for the following year would deter them from engaging piracy – if the ratio was suspiciously low, then officials could pay an auditing visit or require further explanations as to what software the organization is planning to use. Though a potential indicator of effectiveness against piracy, such legislation may face objections and may be completely un-enforceable in some countries, especially in private organizations, thus offering a theoretical conjecture and future research direction for development. Governments are striving to be transparent, and they often have to go through public bidding in service and goods procurement, thus offering an opportunity for using the indicator. For example, the US government has launched a new website (it.usaspending.gov) to track IT spending (Hart, 2009).

5. Discussions and conclusions

5.1. Discussions

Our exploratory study shows that the OS strategy has potential to be adopted as an anti-piracy strategy in the software industry. The software firms we have investigated do not regard the OS strategy as ‘crazy thinking’. In other words, the OS strategy has potential to be adopted, as some of the case firms did, when relevant to the firm’s operations. Two of the case firms, which provided real life evidence, had previously been proprietary software firms. Their proprietary strategy did not work out due to piracy, thus they decided to open source their products. Instead of trying to sell software products alone while worrying about piracy, these firms are offering services to end users along with freely available products.

However, the interviews revealed that the OS strategy is not a one-size-fits-all strategy, and three conditions must apply for the strategy to function – market, software and firm conditions. ‘Market conditions’ require that users be willing to pay for services and be a prerequisite for the OS strategy to work, as the main business logic is to make money from chargeable services. ‘Software conditions’ mean that firms possess large, critical and complex software and that the software requires constant upgrading and modification so that the firm can sell services. These software conditions can be less of a requirement for the OS strategy to work due to variations in end users’ computing skills – some may need services even for less complicated software. ‘Firm conditions’ mean that medium-sized firms may be more suited due to the right ‘fit’ of human resources and financial foundation. However, as evidenced in one case firm, a niche market may provide an opportunity for the OS strategy to function for a small firm as well. These limitations set by the conditions for the OS strategy to function are understandable and quite consistent with previous research on the imperfections of different strategies (Yang et al., 2004).

In addition, six new indicators to assess the effectiveness of anti-piracy strategies have been identified. Firms may measure income and revenues against the anti-piracy strategy: increased revenues indicate the enhanced effectiveness of a strategy against piracy. Improved reputation could also be seen as a relevant indicator of a successful OS strategy: giving free OSS to customers to defeat piracy may create goodwill, quality, and community base. Naturally, a suitable business model must be in place so that the software can be given away for free. Because the OS strategy allows distribution without a piracy concern on both sides, increased size of a firm’s stakeholders (end users, licensees and partners) could also act as a potential indicator of a successful anti-piracy strategy. Likewise, and related to the previous point, our interviewee pointed out that ‘increasing the value of the firm’ could be an alternative indicator of a successful strategy: a valuable user information database could be established through the OS strategy and would act as a potential detour to provide increased value for the firm. Moreover, some firms noted the benefits of development cost reduction through the OSS development model, helping them to avoid the risks associated with high in-house development costs of proprietary software and the no-income-problem. In OSS development, the firm must also take care of licensing, as some OSS licenses may require the derivative software to be OSS. As a result, the OS strategy may allow a quicker upgrade for existing software development, as speed matters in keeping piracy at bay (Yang, Sonmez, Bosworth, 2004). Finally, budgeted expenditure for software against the total expenditure of a firm or organization can also be a good indicator in measuring anti-piracy effectiveness. For example, by comparing software and hardware consumption patterns, a firm can find out the extent of piracy, enabling it to accordingly take actions. This indicator could be particularly useful for proprietary software firms, as the ratio between software budget and total expenditure could become zero when using OSS (as the price of OSS can be zero).

5.2. Research contribution

This study contributes to knowledge in three respects. First, we have proposed a new strategy to add to or act as an alternative to existing anti-piracy strategies – the OS strategy. This strategy can be an alternative anti-piracy strategy in the software industry although its adoption may depend on market, firm and software conditions. In comparison to the existing strategies, the OS strategy may provide a cost advantage when combating piracy on both developer and consumer sides. Second, this research has made empirical contributions to research in the form of case studies. China is at the center of this research, as it is often dubbed the ‘capital of piracy’ (Yang et al., 2004). The findings may provide preliminary implications about how to bring down piracy in a piracy-prevalent environment by adopting this new strategy. Finally, our contribution includes new indicators for estimating the effectiveness of anti-piracy strategies. In addition to confirm prior research that
costs, value, and perception are important measurements to gauge the effectiveness of anti-piracy strategies, we also propose four new indicators, which are software income and revenues, reputation, customer base, and budget expenditure.

5.3. Implications for practice

Practitioners may want to consider adopting the OS strategy as an alternative to fight piracy. When the conditions favor a firm, adopting the OS strategy has potential to alleviate piracy, because OSS license allows free distribution and copying, thereby neutralizing the base of piracy. As a result, the firm is able to legalize users, bringing benefits to both sides (e.g. saving the costs of legal battles in court; gaining registered users). As petty ‘crimes’ might lead to serious crimes (if unlawful actions are not handled), alleviated piracy situation may bring social benefit in the form of higher morale to respecting intellectual property ownership. This assertion was in line with the views that open source community (Stahl, 2005) and Open Source Software (Stallman, 1999) benefit society in many ways. This strategy may also bring several advantages for the firm, including improved market and social reputation, increased number of partners, larger customer base and lowered costs.

Before adopting the OS strategy, the firm, nevertheless, must solve its profit making scheme and that individual firm’s conditions must be carefully assessed. The OS strategy can be adopted to curb software piracy if the software in question is released under OSS license, as pirates have difficulties in putting a price tag for something that is free. OSS was not created to fight piracy, therefore the effectiveness of the OS strategy against piracy might be better thought of as being firm-based. The low costs of OSS may have some effects on reducing piracy by attracting users to OSS. From the firm’s income point of view, the effectiveness depends on the industry and the business model’s profit making scheme.

Furthermore, the joint forces of software firms and government connections may enhance the effectiveness of this strategy. Software firms may want to lobby governments to force firms and other organizations to publish their computing related budgets. This kind of public policy could be useful for both OSS and proprietary software vendors in the digital economy by allowing easy identification of potential pirates. Moreover, the increased transparency would force the users of pirated software to consider alternatives that may include OSS in addition to a legal version of commercial software.

Finally, the changing nature of the software industry must be taken into account. This is based on the argument that the baseline used for measurement may be changing. As noted by our interviewees, there can be many influential factors related to the changes in piracy levels that affect the firm. Whatever the indicator, the firm must be able to measure it before as well as after the chosen strategy against piracy is commenced.

5.4. Limitations and directions for future research

This preliminary study of the OS strategy against piracy has several limitations that warrant future research. First, the theoretical arguments can be deepened through further research. Our preliminary findings, though indicating the probable usefulness of adopting the OS strategy against piracy, need to be refined. One future study could focus on further exploring the OS strategy against piracy in a conceptual manner. For example, how and why might the conditions (e.g. medium-sized firms fit better with the OS strategy against piracy) be applied to maximize effectiveness against piracy; how is ‘reputation’ defined? In other words, do strong hand tactics against piracy damage a firm’s reputation? How can reputation be measured in connection with piracy?

Second, our empirical limitations also require active future research. Our case study consists of eight software firms in the Chinese market and provides a fertile ground to study piracy problems and anti-piracy strategies. China is representative as a data source, but it does not mean that the findings will be applicable to other countries. Given that the feasibility of the OS strategy greatly depends on the market conditions, studies in other countries with high software piracy may help to validate our findings. On the other hand, in countries where piracy is not a major issue, firms may not have such an urge to develop alternative anti-piracy strategies, for example, beyond copy protection. In addition, comparative studies across countries can be conducted to further test the validity of the OS strategy. Our case studies included only firms with less than 400 employees, but firms could also be studied in different homogenous groups in future (e.g. multinational enterprises, small and medium-sized enterprises, proprietary and OSS firms) to reveal the similarities and differences in their OS strategy. In addition to the temporal nature of data may have an impact on findings due to the changing environment when and where piracy occurs. It may be necessary to examine the changing nature in firms’ use of the OS strategy and its effectiveness against the changing environment of software piracy.

Finally, on the methodological front, further research can enrich existing data and validate our findings. As the present research is exploratory, further study using new interview data and/or large sample test would help refine the identified conditions and indicators, and enrich this understudied field. Thus, we hope our ground work can provide academics and practitioners with some insights for further input to the effectiveness of this newly defined anti-piracy strategy.

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