INTRODUCTION

Technological innovation is recognized as a major source of economic growth. Each succeeding generation is materially better off, primarily due to improved products, processes and technologies. Solow (1957) has shown that technological change is the major contributor to non-farm productivity growth between 1909 and 1949. A shocking revelation (for economists at that time) of Solow’s findings is that increased capital intensity contributed very little (about 12.5%, later revised to 19%) to productivity growth. In contrast, technological progress and improved labour force accounted for the remainder of the productivity growth. With this understanding of the extent of the dependence of economic growth on technological innovation, the importance of research and development (R&D) became obvious.

Innovation, in many ways, is a ‘public good’. An innovation created by one company can be copied or imitated by other companies at little or no cost. No company is willing to undertake R&D to create innovation since R&D is often very expensive and imitation or copying is nearly costless. Incentives for undertaking R&D are provided by patents, which offer the innovating company a temporary monopoly, allowing it to recover its R&D costs. Many agree that patents, despite the attendant inefficiencies of monopolies, are perhaps the best system to provide incentives for innovation. It is well known that R&D outlays have substantial benefits outside the industry in which they are incurred. The interindustry technology flow statistics provided by Scherer (1984, pp. 40–9) vividly show that the benefits of R&D incurred in one industrial sector benefit other sectors as well. Diffusion of knowledge is an important prerequisite for supporting technology flows and is also an additional benefit of the patent system. Without patent protection, few inventions will be revealed for fear of being copied. Consequently, the patenting of innovation provides dual benefits to the society: incentives to innovation and diffusion of knowledge.

In the US, recognition of the importance of the creation of temporary monopolies to stimulate invention and innovation dates back to the US Constitution (US Constitution, Article I, Section 8). Patents in the US are governed by the Patent Act (35 US Code). The US Patent Law provides exclusive rights through patents for 20 years (from the date of filing for patent) to inventors of processes, machines, articles of manufacture and compositions of technology flows and is also an additional benefit of the patent system. Without patent protection, few inventions will be revealed for fear of being copied. Consequently, the patenting of innovation provides dual benefits to the society: incentives to innovation and diffusion of knowledge.

In the US, recognition of the importance of the creation of temporary monopolies to stimulate invention and innovation dates back to the US Constitution (US Constitution, Article I, Section 8). Patents in the US are governed by the Patent Act (35 US Code). The US Patent Law provides exclusive rights through patents for 20 years (from the date of filing for patent) to inventors of processes, machines, articles of manufacture and compositions of technology flows and is also an additional benefit of the patent system. Without patent protection, few inventions will be revealed for fear of being copied. Consequently, the patenting of innovation provides dual benefits to the society: incentives to innovation and diffusion of knowledge.

The patenting system has performed reasonably well in enhancing many other technologies. Since the mid-1990s patenting of software and business methods is increasingly accepted in the United States. The legitimacy of many of these new patents is subject to controversy and debate. In this paper we examine the trend, rate of litigation and disposition of US patents in the US Federal Courts. We find that litigation rates of software development, contrary to economic intuition, open source software has emerged as a viable alternative source of innovation. The patenting system has performed reasonably well in enhancing many other technologies. Since the mid-1990s patenting of software and business methods is increasingly accepted in the United States. The legitimacy of many of these new patents is subject to controversy and debate. In this paper we examine the trend, rate of litigation and disposition of US patents in the US Federal Courts. We find that litigation rates of software and business method patents are four times that of all other patents and is increasing. A majority of patent litigations are not won by the perpetrator of the lawsuits. The open source software community is not immune to heightened patent litigations. Since software development is incremental, the paths of OSS and commercial development are entwined. The spillover of patent litigation into OSS may have disastrous consequences: It may increase the ‘cost’ of OSS, dissuade volunteer developers and make OSS less attractive to users.

Keywords: open source software, innovation, intellectual property, business methods, litigation, patent infringement, and patent validity

Authors
Vijay Vemuri (vvemuri@liu.edu) is an assistant professor of Management Information Systems at C. W. Post Campus of Long Island University. He received a PhD from the University of Illinois at Urbana-Champaign. His research interests include e-commerce, strategic implications of information technology and networking infrastructure.

Vince Bertone (vbertone@uslaw.bz) is the IT Director for MITEQ Inc. and also a lawyer and adjunct professor at Long Island University. He received his JD from the Jacob D. Fueschberg Law Center and his MBA and CAS from Long Island University. He is a PhD Candidate at the Palmer School. His research interests include intellectual property law.
matter. To be patentable, the object of invention must be novel, useful and non-obvious.

The need for granting patents to foster inventive activity and to induce higher levels of R&D outlays is firmly entrenched in economic and business thinking. The US Supreme Court’s decision in Gottschalk v. Benson in 1972 led many to believe that algorithms and, hence, software are not patentable (Benkler 2002). During the ensuing years, in order to obtain a software patent, it was necessary to incorporate with either a tangible machine, product or process. Disguising software components within a tangible object in order to patent software was a popular patenting strategy. For instance, Cohen and Lemley (2001, p. 9), state that ‘Under this approach, software was patentable subject matter, but only if the applicant recited the magic words and pretended that she was patenting something else entirely.’

By the mid-1990s the views of the US courts began changing to allow patentability of software inventions (Thomas 2002). In 1994 the US Federal Circuit Court case in re Alappat made it possible to couch patent claims in terms of software inventions, instead of hiding them behind hardware, a machine or a process. In the same year Microsoft was found to infringe on data compression software patented by Stac Electronics and fined $120 million. By 1996, issuance of software patents was legitimized in the US, and the United States Patents and Trademark Office (USPTO) issued examination guidelines for computer-related inventions.

OPEN SOURCE MOVEMENT AS AN ALTERNATIVE SOURCE OF INNOVATION AND DIFFUSION OF KNOWLEDGE

As important as patenting is in stimulating inventive activity and diffusion of knowledge, it is not the only means for achieving these objectives. Educational institutions provide incentives to professors to conduct basic research and to report their findings in research journals through hiring, tenure and promotion policies. Governments also provide resources to conduct basic research to obtain cures for dreaded diseases, such as cancer and AIDS. Scientific organizations may also utilize the talent of volunteers. For example, NASA’s Clickworkers project attracted 85,000 volunteers and resulted in 1.9 million entries in the study of craters on Mars (Benkler 2002). The theme that the innovation process is distributed and many functional sources, including users and suppliers, complement producers in developing novel products and services is extensively discussed in von Hippel (1988). This point is also demonstrated by the ideas discussed earlier regarding interindustry flows of technology.

A new source of innovation has recently emerged in software development. The open source software (OSS) movement of the mid-1990s, characterized by open standards, shared source code and collaborative development of software (O’Reilly 1999), provided the tools necessary to support the growth of the Internet. During this short period many programs, including Apache Web server, Tcl and Perl scripting languages, and the Bind Domain Name System were developed. These programs and Linux, the open source operating system, still remain viable contenders to programs offered by big and powerful software vendors. In purely classical economic terms it is hard to explain how many independent programmers without an authority structure, monetary remuneration and other motivational means develop high quality programs rapidly. von Hippel (2001) observes that ‘User innovation communities shouldn’t exist, but they do.’ In reality, the open source movement is doing much better than merely existing. Virtually every server vendor, including IBM, offers servers with Linux installed on them. In 1999 IBM created the IBM Linux Technology Center, where 185 employees work with the Linux development projects.

We are just beginning to understand how the open source movement works and how effective it is in providing incentives for innovation and diffusion of knowledge. A serious study of the open source movement has just been completed by von Krogh (2003) and von Hippel and von Krogh (2003). Their findings elaborate on the incentives of developers to contribute their technical skills for free for the public good. Another useful study was by von Krogh et al. (2003) in which the authors provide a glimpse at a user community and study motivations to join and contribute code to the FreeNet development process. Lakhani and von Hippel (2003) analyse inner workings of an OSS community in providing user support. From an industrial organization perspective, Lerner and Tirole (2002) get preliminary answers to why OSS projects exist, why programmers participate in OSS and the reactions of commercial vendors to the OSS movement. They identify the technological characteristics of projects conducive to OSS, optimal licensing terms, coexistence of commercial and open source software, and the relevance of the OSS paradigm to other industries as open economic questions facing the OSS researchers.

These studies identify the need for a new framework to understand innovation that is fuelled by enhancing one’s reputation, recognition, understanding of programming, sense of belonging to a group and the psychological satisfaction that can be derived from the higher levels of Abraham Maslow’s hierarchy of needs. According to von Hippel and von Krogh (2003), in software development there are two main tracks of innovation: private investment; and collective action. Until OSS gained a foothold as a viable alternative for software development, patents were thought of as the only alternative for innovation. How do these different sources of innovation interact? An economic policy maker would hope that these two streams of sources of innovation will complement each
other, providing enhanced opportunities for innovation. For a while, in early 2000, these two sources of innovation appeared to be mutually reinforcing. For example, IBM, the largest recipient of US patents in the last ten years with over 20,000 unexpired patents in the year 2003, announced its development effort to support Linux. Here, we have the largest patent holder promoting and implementing an open source objective. But can these parallel sources of innovation coexist? The objective of this paper is to answer this question.

OPEN SOURCE AND PROPRIETARY TECHNOLOGIES ON A COLLISION COURSE

The initial excitement about a mutually beneficial and symbiotic relationship between open source and proprietary software development turned out to be premature. Many recent intellectual property battles make it difficult to predict if these two sources of innovation can peacefully coexist. For example, in March 2003 SCO Group, which owns the intellectual property rights to UNIX, sued IBM for infringing on its rights to Unixware. SCO believes that Unixware is copied into the Linux kernel. IBM responded to this $1 billion lawsuit with its own counter claims, alleging that SCO violated four of its patents. SCO also sent letters to Linux users asking them to buy ‘licenses for Linux’. SCO’s actions created fear, uncertainty and doubt among Linux users, so much so that Hewlett-Packard is offering indemnification to its Linux customers to shield them from any potential liabilities that may result (Kessler 2003). SCO’s intellectual property claims to what appears to be OSS are not an isolated incident. Another example is the UNIX Compress utility (open source) developed in 1984. The utility had to be withdrawn when the patent (US Patent No. 4,558,302) for the LZW algorithm was issued in 1985. The distinction between open source standards and patented technologies is not always clear. Even the World Wide Web Consortium (W3C), a standards body for some Internet protocols, had to delay ratifying SOAP (Simple Object Access Protocol) 1.2 specification due to the patent claims of two companies. SOAP is not an isolated case of confusion over open standards and proprietary technologies. Acceptance of W3C’s Platform for Privacy Preferences Project (P3P), a framework for users to disclose personal information to the websites they visit, was delayed as a result of Intermind’s claims to intellectual property. These examples demonstrate some of the problems with coexistence, and yet they are further complicated by more frivolous claims. Not that these claims identify some incompatibility between patents and the OSS, but rather that the cost involved in patenting as well as the cost of defending frivolous claims are certain to impact not-for-profit developers since the OSS model evolves around minimal overhead and these costs will add to the cost of development. The multiple sources of innovation that work well in other fields do not appear to do so in the development of software. In the next section we present the background necessary to understand the collision course between OSS and intellectual property rights.

SOFTWARE AND BUSINESS METHOD PATENT CONTROVERSIES

The granting of software patents is not without controversy. The OSS community is opposed to software patenting, claiming that it victimizes software developers and obstructs development of software. The Foundation for a Free Information Infrastructure (FFII) presents a strong case against software patents, giving examples of how software patenting hinders development (FFII 2003). Even more controversial than the software patents are the new class of business method patents. The USPTO refers to these patents as ‘Class 705’ patents. In 1998 the Federal Circuit Court sided with the patentability of software-based inventions in its State Street Bank decision. This opened the flood gates for a very broad class of patents involving the Internet in business operations. Often, the underlying business method itself may be well known to all, but the company that obtains the patent for applying this method to the Internet gains patent protection. Many of the business method patents are too broad and potentially every Internet user infringes on one or more patents every time he or she is connected to the Internet. One of the most famous business method patents is Amazon.com’s patent for its one-click (US Patent No. 5,960,411) ordering method. This obvious idea for E-commerce allows the user to carry information about his identity in a web browser. Amazon was criticized for patenting and suing others for such a commonplace business process. In other similar cases, DE Technologies has patented the technology to manage international trade (US Patent No. 6,460,020) and Teledyne obtained patents for gathering information over the World Wide Web (WWW) (US Patent Nos. 5,883,940 and 6,097,792).

Software patents and business method patents, due to their broad and far-reaching claims, are subject to interpretation. DE Technologies’ patents can be (and sometimes are) interpreted to cover any international transaction over the Internet. With this confusion about the scope of the patents, intellectual property rights litigations have increased. The recent British Telecom case illustrates the vast potential for litigation. Conventional wisdom suggests that the hyperlink metaphor is a part of the WWW, and hence an open standard. However, British Telecom believed it held the patent on all hyperlink technologies. The company contacted Prodigy and 16 other Internet service providers, including America Online, to license its hyperlink patent. When they refused, British Telecom pursued Prodigy as a test
case. In August 2002 the US District Court dismissed British Telecom’s claim.

Any inventor who fails to obtain a patent for an invention can be sued by another firm or individual that later patents that invention. This apparent injustice led many firms to patent every potential patentable invention, however minor it might be. Many dubbed this dash to patent all the potential inventions as the ‘patent race’ (Ignatius 2000). The vocabulary of patent races is reminiscent of the nuclear arms race — terms such as patent disarmament, patent non-proliferation and offensive use of patents were coined. To reduce patenting of trivial inventions and subsequent litigation thereof, the patent laws of the United States were amended by the American Inventors Protection Act of 1999 (AIPA). An important provision of AIPA is the First Inventor Defense. This defence against patent infringement can be raised when the invention is in use for one year or more before a patent application is filed for the invention.

POTENTIAL PATENT ABUSE

In recent years the patent process has come under sharp criticism. Patents are alleged to have been used not just to protect intellectual property but to achieve goals not foreseen by the patent laws. Some examples are listed below:

- **Use of patents for extortion**: PanIP, a technology development company based in San Diego, sent notices to 50 small electronic retailers (located outside California) at a time threatening to sue in California if they failed to pay a $5,000 licensing fee for its standard e-commerce credit check patents. Some electronic retailers paid the license fee knowing that court costs could be higher than the license fee. Many (Soat 2002) equate selective enforcement of questionable patents on smaller companies that cannot afford legal costs to high-tech extortion.

- **Use of patents to silence critics**: Gregory Aharonian is an outspoken critic of the US patent system, especially software and business method patents. He runs a patent newsletter in which he is critical of TechSearch, LLC, an intellectual property management company. TechSearch filed a patent infringement suit against Aharonian (Thomas, 2002). The company claims he is infringing on its remote query communication system patent. In reality, every user of a web server is in violation of this questionable patent. Harassing a critic with patent infringement is definitely not what is intended by the patent laws.

- **Use of patents for tax avoidance**: Many companies have donated patents with values estimated in the hundreds of millions of dollars. These donations qualify for tax deductions and generate sizable savings on income taxes. These tax incentives can give rise to the donation of worthless patents at inflated values (Riordan 2003). For example, SBC Communications donated patents covering virus screening valued at $7.3 million to the University of Texas. The patent is not expected to generate any revenue for the university, but it surely will reduce SBC Communications’ tax liability.

- **Use of patents as a defence in future patent litigations**: In the previous section we have discussed that for defensive purposes many companies are patenting inventions that they would not normally patent. The prior use defence of AIPA may protect companies to some extent from patent infringement lawsuits, yet patenting of innovations for defensive purposes appears to be prevalent. Frequently, a legal dispute by the patentee claiming patent infringement results in a counter-claim for patent invalidity by the alleged infringer. For this strategy to be effective, many companies patent innovations that are small and incremental. These patents are not expected to protect innovations but serve to thwart potential infringement lawsuits.

PATENT LITIGATION

Anecdotal evidence suggests that patent infringement litigation is increasing in the US. But there is no systematic study to indicate if the above observation is valid. Lanjouw and Schankerman (2001) study patent litigation from an economic perspective and find that litigation risk depends on patent type. The drugs and health technology group has a much higher litigation rate than the chemical group. The nationality of the patentee and the form of its organization (individual or corporate) has a bearing on the litigation rate. Their econometric analysis shows that the number of patent claims and forward citations per claim have a significant and positive effect on patent litigation rate. Lanjouw and Schankerman (2002) show that there was a large increase in patent litigation rates during the 1990s and that a vast majority (about 95%) of the patent lawsuits are settled out of court. In this research we study the trends in patent litigation — our emphasis is on software and business method patents alone — and we test if software and business method patents are systematically different from other patents in terms of frequency of lawsuits and chances of winning patent infringement claims. All cases analysed and described as patent cases or patent infringement cases are those claims protected under Title 35 of the US Code. Although many actions are initiated for patent infringement, this analysis utilizes matters that have been decided at some level by a US Federal Court of law.

The conclusions of this study are important for many reasons. The two studies just cited have shown that the litigation rate is heterogeneous, depending on many characteristics of the litigants. The probability of
settlement and plaintiff win rates, however, do not depend on these characteristics. These studies do not include software and business method patent litigation. Because of the relative newness of these patents, not much is known about the litigation involving these patents. In this paper we will extend our understanding of patent litigation to software and business method patents.

The open source community needs to understand the developments in patent litigation since (as explained previously) these two streams of innovation are interlinked and possibly headed on a collision course. Without understanding the chances of being dragged into patent litigation, the nature of defences, possible outcomes, penalties, remedial actions and probability of various outcomes, the OSS community cannot make proper choices. A decision to undertake a software development project that may potentially violate the intellectual property of others should be based on chances of litigation and potential loss under various scenarios. Besides focusing on software and business method patents, we contribute to methodological improvements (to be further discussed in the next section) by utilizing complete population of patent case rulings and refining litigation rate computations. The analysis of entire populations avoids statistical and econometric problems.

Research questions

For a clearer understanding of the legal threats facing the OSS movement and to assess the possibility of multiple software development sources and their coexistence, we raise the following research questions:

1. Is there an increasing incidence of patent litigation in general and software patent litigation over time?
2. Do software and business method patents have higher rates of patent litigation than all other patents?
3. Are the probabilities of obtaining a favourable judgment in software and 705 patent litigation in favour of the patentee or the alleged infringer?

DESCRIPTION OF DATA AND LEGAL PROCESS

As previously mentioned, prior to the mid-1990s software was combined with tangible machines, products or processes to qualify for a patent. Consequently, it was difficult to ascertain which patents are software patents since even if the innovation pertains to software, it was disguised as or combined with hardware to obtain a patent. Many different approaches have been utilized to determine if a patent is predominantly software-related. Bessen and Hunt (2003) and others have identified key words such as ‘software,’ ‘computer’ and ‘program’ in the specification section of the patent application. We have utilized the Organization for Economic Co-operation and Development (OECD) scheme to classify the patents. The US patent classes: 345, 701–704, 706, 707, 716 and 717 are considered software patents (OECD 2002).

Three different sources of US patent data are utilized: 1) USPTO data available on CD-ROM; 2) patent database available online at www.uspto.gov; and 3) CASSIS database available at patent and trademark depository libraries (SIBL of the New York Public Library is one such depository library). The litigation information was obtained from the Westlaw database of Thomson West. Westlaw contains patent litigation decisions rendered by all Federal Courts and the US Supreme Court. The Westlaw database contains the results of all cases decided by the US Federal Courts. Although there can be some delay from the time a case is decided to the time it is incorporated into the Westlaw database, the delay tends to be relatively small. Westlaw is a primary data source for many attorneys in the US and consequently we have little reservation for using them as a data source for this study.

The first methodological improvement we make is in obtaining complete knowledge about each US federal case we study. The two patent litigation studies previously mentioned classify patent litigation as a patent validity case if the patentee is the defendant. We believe this will bias the results since many of these cases do not question validity at all. Our findings indicate that many cases seek guidance from the courts in the form of declaratory judgments. These alleged infringers want the court to rule that their product or process does not infringe on the patent, and they do this without a claim questioning the validity of the patent. By studying the text of a complete case available in the Westlaw database, we are better able to classify them and avoid potential bias.

Motions for summary judgment or a declaratory judgment whether granted or denied are not an indication of a win or loss. For example, a summary judgment that is denied simply means that there is a triable issue of fact and the claim presented cannot be decided as a matter of law. When a patentee sues an infringer and the court affirms his or her allegations, it is considered a win. Conversely, if the alleged infringer initiates a motion for declaratory judgement and the court grants the motion, it is considered a win for the infringer. In many cases a district court’s decision can be appealed and remanded back to the district court with instructions from the appellate court. This then requires the district court to revisit the case and its decision while keeping the decision of the appellate court as a primary consideration. It is not uncommon to discover a partial win/loss remanded scenario. Additionally, a majority of the cases analyzed attempt to assert multiple claims and arguments. For example, they may challenge patent infringement but may also assert a claim against the patent’s validity. Asserting many claims to support one’s position allows for multiple chances to win within the same case (one
way to develop judicial economies of scale). If a person loses one claim he may win the other. Additional claims do not add to the cost of a lawsuit and yet they increase the chances of getting at least a partial victory.

It is difficult to break down and classify cases without listing several columns for all of the possible combinations of claims and outcomes. Consequently, for the sake of simplicity, when an issue has not been decided in favour of either side, the person making the claim will be identified and the case added to the win/loss (partial) column.

ANALYSIS OF THE DATA

Growth in software, business methods and total patents

The USPTO issues many types of patents, including utility patents, design patents, plant patents and reissue patents. Only utility patents are relevant for the innovations discussed in this paper. Figure 1 shows the total utility patents, software patents and business method patents issued since 1993. We selected 1993 as the starting point because it is the year before *re Alappat* was decided and the beginning of the surge in software patents.

Active patents

In June 1995 the length of the life of a patent in the US changed from 17 years from the date of issue to 20 years from the date of filing. All of the patents issued in 1977 were still active in 1993, but some that were issued in 1976 expired in 1993. To determine the litigation rate, we compute the active patents for every year since 1993. The last two columns in Table 1 show the number of active patents in each of the last ten years. These active patent numbers change throughout the year. They will change.

Table 1. Patent infringement and validity cases and active patents

<table>
<thead>
<tr>
<th>Year</th>
<th>All cases</th>
<th>Software + 705 cases</th>
<th>All cases</th>
<th>Software + 705 cases</th>
<th>Software + 705 Patents</th>
<th>All utility patents</th>
</tr>
</thead>
<tbody>
<tr>
<td>1993</td>
<td>138</td>
<td>7</td>
<td>41</td>
<td>5</td>
<td>26,775</td>
<td>1,173,091</td>
</tr>
<tr>
<td>1994</td>
<td>161</td>
<td>12</td>
<td>36</td>
<td>3</td>
<td>29,551</td>
<td>1,206,272</td>
</tr>
<tr>
<td>1995</td>
<td>180</td>
<td>14</td>
<td>53</td>
<td>4</td>
<td>32,770</td>
<td>1,241,892</td>
</tr>
<tr>
<td>1996</td>
<td>176</td>
<td>13</td>
<td>50</td>
<td>3</td>
<td>36,461</td>
<td>1,294,845</td>
</tr>
<tr>
<td>1997</td>
<td>200</td>
<td>25</td>
<td>62</td>
<td>12</td>
<td>40,885</td>
<td>1,342,333</td>
</tr>
<tr>
<td>1998</td>
<td>196</td>
<td>29</td>
<td>50</td>
<td>6</td>
<td>45,689</td>
<td>1,388,581</td>
</tr>
<tr>
<td>1999</td>
<td>235</td>
<td>41</td>
<td>68</td>
<td>9</td>
<td>54,289</td>
<td>1,478,281</td>
</tr>
<tr>
<td>2000</td>
<td>223</td>
<td>44</td>
<td>63</td>
<td>9</td>
<td>62,930</td>
<td>1,575,014</td>
</tr>
<tr>
<td>2001</td>
<td>323</td>
<td>79</td>
<td>95</td>
<td>20</td>
<td>71,409</td>
<td>1,665,396</td>
</tr>
<tr>
<td>2002</td>
<td>385</td>
<td>86</td>
<td>104</td>
<td>21</td>
<td>81,122</td>
<td>1,759,889</td>
</tr>
</tbody>
</table>
increase as more patents are issued and decrease as earlier patents lapse. The numbers we compute are a fairly good approximation of weighted average active patent numbers through the year. Prior studies have utilized the ratio of number of patent lawsuits filed to the number of patent applications in that year to measure patent litigation rate. We believe that denominator should be based on the number of active patents. In a stable patenting environment both approaches will yield fairly close metrics. But in the past 20 years patenting activity in the US is anything but stable, and our approach measures patenting rate based on an accurate count of active patents open to litigation.

Total number of patent cases

We analyse the cases in the Westlaw database to determine the number of patent cases. In their study of patent litigation Lanjouw and Schankerman (2001) use the Federal Judicial Center data of the Inter-university Consortium for Political and Social Research (ICPSR). These data are also used by Graham and Mowery (2003) to analyse differences in the incidence of software suits and all law suits of large 100 software firms. The highly summarized nature of ICPSR data makes it impossible to completely identify the resolution of a case. The arduous task of reading each case decided in the Westlaw database allowed us the opportunity to accurately identify the type of case, whether it is an infringement or a challenge as well as the opportunity to merge multiple cases, when possible. Many cases are decided, but a final ruling does not come about until all legal resources have been exhausted since a case can be appealed in whole or in part and decided at different levels until they reach the ultimate court — the United States Supreme Court. Consequently, if a law suit decided at the District Court level was discovered on the Appellate Court level, it was not counted as two cases, but only as one, and if the results of the Appellate level were different than the District Court level then the findings were adjusted accordingly. This provided us with a greater level of accuracy than the previous studies.

RESULTS

By now it should be evident that we do not deal with statistical testing procedures and test statistics. Our data sources and research questions provide us with a rare opportunity of studying the entire population of cases decided by the courts. Admittedly, these court decisions do not cover the full range of patent litigation. In particular, they do not include pending litigation. Additionally, the cases examined are not a complete representation of what is really happening in a litigious society. As litigation is expensive, many cases never make it to trial since they are either withdrawn or settled before they are even decided. What we have analysed here is litigation that had to be resolved only through legal processes. Yet this analysis may not be a complete representation of all patent litigation taking place as every case decided has the opportunity for appeal. Consequently, the number of cases we present underestimates the extent of patent litigation, but provides reliable estimates of the trends in patent litigation. Another consideration for the decision analysis of a case is the type of judgment and its significance to the claim presented. No random (or otherwise) sampling or statistical inferences are involved. We are able to test our hypotheses with very simple procedures and descriptive statistics and yet make valid statements.

We collected all the case information pertaining to patent infringement and patent validity cases from Westlaw. A vast majority (nearly 90%) of patent cases fall into the above categories. Table 1 also provides the breakdown of patent cases by infringement and validity claims. Figure 2 compares the rate of infringement cases per 1,000 active software and all patents. The graph unambiguously shows that the rate of software and 705 patent infringement cases is markedly higher than all patent infringement cases. Figure 3 shows similar patterns for patent validity cases. Once again the marked difference clearly demonstrates the increasing number of software and 705 validity cases.

Our patent litigation rates are in the range 0.01% to 0.11% over the last ten years. These numbers are substantially lower than the patent litigation rates reported in the literature (0.5% to 2% in Lanjouw and Schankerman (2001 and 2002)) for two reasons: 1) our rate is based on total active patents in each year, not merely the number of new patents applied for in that year and 2) our litigation counts reflect only the disputes that had to be resolved in the Federal Court system.

Table 2 shows the success rates of patentees in infringement cases and also identifies the number of claims successfully challenging the validity of patents by alleged infringers or individuals with standing to challenge. This table clearly indicates that the patentee is losing more than 50% of the actions brought. The patent validity litigation data is not quite as striking. It indicates that the alleged infringer is winning in approximately 30% of the cases. The table suggests that in the majority of patent litigation cases the party that brought the suit is not successful.

DISCUSSION OF RESULTS

An examination of Table 1 clearly demonstrates that both patent validity and patent infringement cases are increasing at a higher rate than all patent cases. The rate of patent infringement cases is much higher than all patents cases in each of the ten years studied; the ratio is also increasing over time. An analysis of patent validity cases yields similar results. This is a significant finding
Figure 2. Rate of patent infringement cases

Figure 3. Rate of patent validity cases
losing in approximately 50 per cent of the cases they are

ing the issuance of patents. Infringers are winning in

since it tells us that more and more people are question-
ing the issuance of patents. Infringers are winning in approximately 30 per cent of the cases, and patentees are losing in approximately 50 per cent of the cases they are initiating for infringement.

This finding troubles us as it is clear that patentees are beginning a significant amount of litigation, which is being ruled by the courts to be without merit and which can only serve to create more concerns for the open source movement. But why should this be a concern for the open source movement? Under concepts of respon-
dent superior an employer is responsible for the torts of his employee, meaning that if the employee violates the intellectual property rights of another for the furtherance of his employer, the employer is responsible for all damages. This gives the employee a significant amount of freedom since he is not concerned with paying any legal expenses or damages from his own pocket. However, the individual who develops a product in the open source movement that violates the intellectual property rights of another is personally responsible for the damages that result. Consider SCO v. IBM. How can any open source developer work on a product that is currently under litigation (having effective notice that intellectual property rights may have been violated)? The developer has no choice but to wait for a court ruling. Continuing forward only exposes the developer to liability if the court decides that a protected property right was violated. And how long will this case take? Consider the growth of software infringement and validity litigation compared to all litiga-
tion. The growth is three to five times the rate of conven-
tional patents, and yet software patents are a relatively new phenomenon.

The SCO Group and IBM case is the first high profile case in which the open source movement is becoming involved in intellectual property disputes. We do not expect this case to be an aberration. More and more conflicts between the OSS movement and patent rights are to be expected. The increased incidence of software patent litigation has many implications for the OSS movement. Considering this increase in litigation in this area, how long will it be before more cases are initiated that have a similar impact on software developed by the open source movement leading to the basic question: Who is going to develop software for free when there is a potential for litigation in the future? This potential for liability will necessitate the need for liability insurance to protect developers. This overhead will negate the basic premise of this movement, which is that software can be developed for free, since the movement is not subject to the same overhead as the private industry. How do the high rates of software litigation affect the OSS movement? Because of the availability of the resources to license patented software and their own collection of existing patents for use in cross-licensing, commercial software vendors are better equipped to cope with software litigation than the OSS movement. Most innovations and software development, in particular, are incremental in that they build upon a prior body of knowledge. Consequently, the OSS and commercial software may appear as two separate paths of software development but are, in reality, highly entwined. For example, the recent delays in the W3C efforts to set standards due to proprietary standard claims attest to these tangled paths. The OSS movement needs to build mechanisms to ensure that the contributions of the volunteers are not eventually blocked due to intellectual property litigations.

CONCLUSIONS

The innovations in the software industry are conducted by two significant forces: private investment and collective action. How well will they work together to foster innovation in the software industry is not clear. Earlier it appeared that these two motivators are complementory. However, intellectual property litigation in the recent years seems to be threatening the collective action. We analysed the US patent and US litigation data with a focus on software patent litigation vis-à-vis all patent litigation. We find that there is an increase in patent litigations over time. The results also indicate that software and 705 patents are about four times as likely to be litigated and that this rate is increasing. In a majority of cases the perpetrator of the legal action does not win the court case. What appears to be two independent paths of innovation in the software industry are not, in fact, independent. Commercial software vendors are increasingly becoming involved in OSS development and open standards, and open source code is being built upon protected intellectual property. An open question.

Table 2. Winning percentage of software and 705 patent infringement and validity cases

<table>
<thead>
<tr>
<th>Year</th>
<th>Infringement brought by patentee</th>
<th>Validity challenged by alleged infringer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Win</td>
<td>Loss</td>
</tr>
<tr>
<td>1993</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>1994</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>1995</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>1996</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>1997</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>1998</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>1999</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>2000</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>2001</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>2002</td>
<td>6</td>
<td>16</td>
</tr>
</tbody>
</table>
is, how well will these two tangled paths of software development work together? If software litigation spills over into OSS development, the future of the OSS movement can be bleak, since the volunteer developer may become mired in potential litigation costs. Financial resources that are available to commercial developers to license technologies and their cache of patents to gain cross-licences are not available to the OSS movement. Consequently, this may make it difficult for the OSS community to deal with relentless litigation. Even if patent litigation does not directly involve software developers, users of OSS can be held liable for patent infringement. OSS users may have to face additional cost of litigation and/or licensing in their evaluation of adopting OSS. With all these potential legal problems facing the OSS community, only future litigations will tell the destiny of the OSS movement.

References