

**Innovation without Property Rights and Property Rights without Innovation:
Recent Developments in the ICT Sector**

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Abstract

At one end of the spectrum, the rapid diffusion of open source software (OSS) since the mid- 1990s represents what one might loosely call innovation without intellectual property rights (IPRs). The rise of OSS has vastly expanded the “public goods” character of software innovation, thus raising serious issues concerning the current system of IPRs—as they apply to software—and its enforcement. Open source software can be expected to play a more significant role in the development of applications in the ICT sector, as exemplified by Google’s plans for introducing open platforms in conjunction with its mobile phone service offering in partnership with selected mobile carriers.

By contrast, at the other end of the spectrum, is what one might refer to as IPRs without innovation as evidenced in the case of recently settled *NTP Inc. vs. Research in Motion, Ltd.* In this case, NTP, a Virginia-based patent holding firm had sued Research in Motion (RIM), which threatened the existence of the latter. In another patent infringement case, Vonage Holdings Corp., which pioneered Voice over Internet Protocol (VoIP)—at more than half the price of landline companies—had settled with Verizon, which viewed Vonage as a huge threat and used its patent portfolio as a defensive move to protect its existing dominant position. The paper examines these developments, broadly, in the context of the rapid rise of OSS and concludes that there is a trend towards co-existence and convergence of open source and closed source models.

Keywords: ICT sector, Open Source Software, Innovation and Intellectual Property Rights

Innovation without Property Rights and Property Rights without Innovation: Recent Developments in the ICT Sector

Introduction

At one end of the spectrum, the rapid diffusion of open source software (OSS) since the mid-1990s could loosely be characterized as freely shared innovation, unencumbered by the kind of formal intellectual property rights such as patents that have been traditionally relied upon by the owner of such intellectual property to protect its proprietary products from appropriation by others. At the other end of the spectrum, litigation to enforce the owner's formal intellectual property rights, particularly patents, could be characterized as fostering a legal regime that has imposed additional costs and risks on innovators that are extrinsic to the costs and risks inherent in R&D undertakings.

The reality lies somewhere in between these two polar extremes. As discussed below, patents and open source can co-exist quite well and provide a framework that combines the best of both worlds, producing a mutually reinforcing climate to bring about more socially useful innovation.

Patent Litigation

Background

Patent laws provide legally enforceable protection for new and useful inventions. The inventions must be unique when compared to previous technology in order to qualify for a patent.

By obtaining a patent, the patent owner (also known as the patentee) is granted a monopoly on the use and commercial exploitation of the patented invention for a stipulated period of time – in the U.S., for example, 20 years from the date of first filing.

A patent effectively walls off the protected invention from being used by others without the owner's consent. The patentee may practice the invention, sell (assign) his or her patent or license others to make, use or sell the patented invention in exchange for royalty payments. The patentee is also free to decide not to license its patents at all or to cross license with other firms so that it can receive valuable patent licenses in return from those firms.

Anyone who is not authorized to make, use or sell any product or service that relies on the patented invention is guilty of infringing the owner's patent and is subject to being stopped by a court injunction from engaging in such prohibited activities as well as to being assessed with damages owing to the patent owner. There is today a fairly wide scope for awarding damages. It may be based on a calculation of lost profits from the infringement if that is determinable, but can be no less than a "reasonable royalty" - a phrase that is not defined in the statute.

The benefit to society in return for granting patent monopolies is to provide incentives for undertaking or investing in research and development by ensuring the patent owner the legal means to appropriate the full commercial benefits of the invention. At the same time, when a patent is issued there is public disclosure of the invention.

Software developers originally relied on copyrights as the preferred means to protect their intellectual property rights because it was much cheaper and quicker to obtain this form of protection. However, copyrights protect only the particular expression of an idea (i.e., the software code as written), not the innovative features, functionality or architecture of the software. Thus, there have been many more patent filings in the last two decades as court cases made it easier for software firms to uphold the validity of their software

patents under liberalized standards of proof. Developers and investors recognized that patent protection is far more effective and broader than copyright protection in ensuring that competitors are excluded from appropriating the rewards of the invention's success. It has been estimated that between 1990 and 2001, patent applications per billion dollars in sales or R&D by prepackaged software firms and system-design firms rose at least 300% from 1990-2001 (Allison, Dunn and Mann 2007).

Recent Trends in Patent Litigation

As expected, patent enforcement litigation in software and related fields has spiraled in the last two decades in keeping with the increased use of patents as the preferred means of securing intellectual property protection. Critics of the patent process claim that the substantial risks associated with patent infringement litigation and the enormous expense incurred in defending against such lawsuits have forced firms accused of infringement into settlements on disadvantageous terms. Just the legal expenses alone in defending against a typical patent infringement suit could well exceed \$2 million. The fear of being the target of such litigation with uncertain outcomes, including injunctions and huge damage awards, have deterred firms from undertaking innovative projects that have the real prospect of inviting infringement challenges from an opportunistic plaintiff. Such a plaintiff can prevail without having to prove that the alleged infringer copied its design or features or even knew that a patent covering the technology existed.

NTP, Inc. v. Research In Motion

Perhaps the most egregious example of a patent litigation, with nearly catastrophic effects on the defendant, involved the high technology provider of the BlackBerry service, Research in Motion ("RIM"). RIM's BlackBerry service, software and devices allow

individuals to send and receive information on a wireless basis, such as e-mail and company data, via handheld devices. RIM's own patent, which was granted in 2001, described a method of directing e-mail to wireless devices, while maintaining mailbox synchronization with a desktop e-mail system. The BlackBerry is a closed, single-vendor e-mail system, based on a set of proprietary protocols.

RIM was threatened with a potential shutdown of its service in the United States as a result of a patent infringement suit filed by NTP, Inc. ("NTP") against RIM in 2001. NTP is a Virginia-based patent holding company whose primary asset is a portfolio of at least 50 U.S. patents, which focused on inventions in the fields of wireless email and RF Antenna design. NTP has been referred to by some as a patent "troll", which is a company in the business of regularly going to court to aggressively enforce its patent rights to the limit even though the patent owner does not manufacture, sell or use the patented invention itself in any product or service and does no technology research of its own.

NTP was highly successful in its lawsuit against RIM, winning a jury verdict and obtaining a ruling by a federal judge that granted an injunction which, when put into force, would prevent RIM from making, using, or offering to sell handheld devices, services or software in the United States that were deemed to infringe NTP's patents. RIM appealed all of the findings of the court and got a stay of execution pending the outcome of the appeals. However, after fits and starts at negotiations to settle the lawsuit and with its appeals exhausted, RIM faced the prospect of an immediate shutdown of its service once the injunction was actually put into force (*NTP, Inc. v. Research In Motion* 2006). RIM had some success in getting the U.S. Patent and Trademark Office to reverse

its earlier findings regarding the validity of NTP's patents and to issue *preliminary* rejections of most of the applicable patents. RIM also sought to assure its major customers that it had developed a software work-around that would not infringe the NTP patents. However, all this was too little too late. After the federal judge in charge of the case ignored the patent office's preliminary decision to invalidate some of NTP's patents that had previously been approved and issued an ultimatum that effectively put RIM's back to the wall, RIM finally reached a settlement agreement with NTP for *\$612.5 million*.

This case is a classic example of how the legal system was misused to enforce questionable patents by a firm that had not produced any innovations of its own. The lawsuit worked to NTP's own self-serving benefit, giving it the judicial clout to block an innovative service from being offered nationwide to the public unless RIM was willing to disgorge a huge ransom's sum in damages – which RIM ultimately decided to do.

Emboldened by this big win, NTP filed patent infringement suits in September 2007 against the four largest wireless carriers in the U.S. - Verizon Wireless, AT&T, Sprint, and T-Mobile. Meanwhile, RIM remains in the thicket of other patent infringement battles. Motorola filed a lawsuit in February 2008 claiming that RIM infringed on seven of its patents in various BlackBerry 8000-series devices and the BlackBerry Enterprise Server. This came in response to a patent suit filed by RIM, which claims that Motorola infringed several of its patents.

Verizon v. Vonage

Not to be outdone, Verizon has gone on the offensive by bringing patent infringement suits of its own, including the *Verizon v. Vonage* case (2007) against Vonage Holdings

Corp., the Internet telephone service provider who pioneered Voice over Internet Protocol (VOIP). This service was offered at a steep discount from the prices charged by the incumbent carriers for their standard telephone service. Verizon viewed Vonage as a huge threat to its telephony business and used its patent portfolio against Vonage to protect its existing dominant position. It won a damages award and injunctive relief at the U.S. district Court level. The U.S. Court of Appeals for the Federal Circuit upheld the infringement and injunction decisions against Vonage for two of three patents involved in Verizon's lawsuit and sent the case back to the District Court regarding the third patent and the calculation of damages. Verizon emerged as the winner in upholding the finding of infringement and injunctive relief with respect to two of its patents and the real prospect of eventual success on the third. Vonage faced a possible final decision at the conclusion of the case that would have prohibited Vonage from connecting Internet calls to standard phone lines, an outcome that could well have put the small innovative Internet telephony firm out of business altogether. The suit was ultimately settled for \$120 million, a major financial hit for a firm the size of Vonage which lessened the resources it could devote to developing more innovative services. Verizon has more recently brought similar patent infringement suits against two of its cable competitors.

The RIM and Vonage cases illustrate the increase of patent litigation that has been brought affecting wireless and wireline telecommunications technologies that mirror the increase in patent litigation that has enveloped the software industry.

In terms of the cumulative impact of the increase of patent litigation across diverse industries, Bessen and Meurer (2005) concluded in their empirical study entitled the "*Patent Litigation Explosion*" that the "sharp increase in the probability of being sued per

R&D dollar implies an increase in the ‘tax’ that litigation imposes on innovation.” Software patents contributed to this growth as they cross over and affect a variety of applications in different industries such as telecommunications, as we have seen.

All in all, based on their findings, Bessen and Meurer (2005) dismissed firm patenting rates, R&D spending, firm value or industry composition as the primary explanations for the rapid rise in patent litigation. Instead they concluded that a more favorable climate for legal challenges against patent infringers has been the predominant driver of the rapid growth of litigation, which in turn “represents a growing disincentive to R&D that is not likely offset by growth in the number or value of innovations... we find evidence that this disincentive is borne by firms not only in their roles as patent holders, but also as innovators having to defend against patent lawsuits. We find that the more R&D a firm performs, the more likely it is to be sued.” (p. 28)

In an effort to curb the threat of runaway patent litigation that can suppress real innovation, the Supreme Court has recently issued two important rulings.

In the *eBay v. MercExchange* (2006) case, the Supreme Court made it tougher for plaintiffs like NTP (whose business is to license patents rather than use the patents themselves) to wield the threat of injunction against those whom they accuse of infringing those patents. The decision came out a couple of months too late to help RIM but it is a step forward in discouraging abusive patent litigation.

In the *KSR International Co. v. Teleflex, Inc.* (2007) case, a unanimous Supreme Court ruled in favor of applying more rigid standards for obtaining a new patent, excluding from eligibility for patent protection an advance that would be "obvious" to someone of ordinary skill in the field.

The Court said that “granting patent protection to advances that would occur in the ordinary course without real innovation retards progress... When there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill in the art has good reason to pursue the known options within his or her technical grasp. If this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense.” (KSR International Co. v. Teleflex, Inc. 2007)

In essence, the Supreme Court has now made it easier for firms accused of patent infringement to challenge the validity of the patents at issue by showing that the patents wrongly provided exclusive rights to technology that did not in fact represent true innovations.

Congress is also considering patent reform legislation. If passed, it may further discourage lawsuits brought by patent trolls. The legislation being considered would also bring more order to the assessment of damages for infringement. Instead of allowing windfalls to plaintiffs who are awarded damages in the form of royalties assessed against the entire market value of an infringing party’s product or process when the patented invention that was infringed adds only a small increment to that value, more rigorous proof in setting a reasonable royalty will be required. The purpose is to ensure that the percentage royalty which the patent holder would be awarded from the infringing party is applied only to the portion of the economic value of the infringing product or process properly attributable to the claimed invention’s specific contribution over the prior art. Under this legislation, minor improvements that are the subject of a patent would not merit the patent owner receiving a royalty payment based on the market value of the

entire underlying product or process that infringes such an incidental patent. Lowering the prospect of windfalls from a patent infringement lawsuit would hopefully discourage some lawsuits from being brought in the first place. Note that it is important to distinguish between the deleterious effects of the activities of patent trolls on innovation from the possible effects of the emerging “market” for technologies in the form of licensing, cross-licensing and the like (Arora et al. 2001 and Baumol 2002).

As significant as these legal developments may become for the software and telecommunications industries in helping to curb excessive patent litigation, the increasing influence of open source software on the patenting behavior of mainstream incumbent firms may turn out to have a more profound effect.

Open Source Software and Patents

Background

The “open source movement” was founded upon the notion that software should be freely available and “open” to modification and development – hence the label open source software or OSS for short. The Linux operating system is a prime example of open source software that was developed to counter Microsoft’s monopoly power in proprietary software operating systems. As the development of OSS evolved under the leadership of such organizations as the Open Source Initiative, open source software began to serve the needs of businesses while still ensuring the wide dissemination of software without restrictions on further innovative developments from multiple sources. Note that the Open Source Initiative is recognized by open source developers as the steward of the

Open Source Definition and as the body for reviewing and approving licenses as conformant to this definition.

OSS programs are distributed subject to the terms and conditions of different forms of license agreements. The most common form of OSS licenses is the GNU General Public License (“GPL”), which is now in its third iteration. Although several other forms of license exist (e.g., Mozilla Public License; and the Apache Software License), GPL holds the dominant share (69 percent) of the open source license projects (Table 1). It has been estimated that worldwide software revenue based on Linux and other open source environments alone will be at \$16.9 billion in 2009, with a 36 percent average annual rate of growth between 2004 and 2009 (Forfas 2006).

While these licenses give users certain freedoms with respect to the use and modification of the subject programs, they also may contain certain affirmative obligations – sometimes referred to as “copyleft” terms. The most important terms include the following:

- Any distribution to third parties or publication of a proprietary product that contains or is derived from open source software must be made available at no charge, assuming that the resulting product is distributed or published as one integral “whole” work. In other words if a developer combines open source software code with the developer’s own proprietary code or derives a proprietary software product from the open source code, that developer will not be able to impose a licensing fee for the resulting hybrid product (“Hybrid Product”). The whole work must be made freely available on the terms of the applicable license. What is considered a “whole work” will likely turn on a number of technical issues such as how closely the programs interact, how they are

linked, and how the proprietary program loads with the underlying open source kernel (which is the underlying portion of the operating system that interacts the most closely with the hardware on which the operating system runs).

- The distribution of the Hybrid Product in object code form must be accompanied by the complete corresponding source code for the product or an opportunity to access such source code. Therefore, if the developer were to offer a Hybrid Product the developer must also provide access to the corresponding source code to enable others to modify it as they wish and may not impose a licensing fee for such source code.
- All patents considered essential to implementation and use of the Hybrid Product must be either licensed under royalty-free terms for unrestricted use, or be covered by a promise of non-assertion when practiced by open source software. If the developer initiates a patent litigation against any third party alleging that the code distributed under the open source license agreement infringes the developer's patents, all licenses to any particular code granted to the developer under the open source license terminate – including with respect to the developer's rights in the open source code embodied in its Hybrid Product. This is a backdoor way of forcing the developer to choose between forgoing an enforcement action to stop or punish use of its own patents in open source software (and in effect give up the ability to profit directly from the patent monopoly itself), or sue for patent infringement and stop its own beneficial use of that same open source software.

The Co-Existence and Convergence of Open Source and Patent Regimes

The economists Boldrin and Levine (2007) have written that “the message of open-source software is a message for all industries: IP not needed for innovation here.”(p. 28)

Similarly, Merges (2004) has argued that open source can be viewed as a market correction against intellectual property (IP) protection overload.

At first glance, the open source ethos of promoting free sharing of innovations would appear to conflict sharply with the rationale of patenting, which is to protect proprietary innovations from misappropriation and to internalize the return from R&D as much as possible.

If this were so, one would expect to see very divergent paths followed by the open source development community on the one hand, whose members eschew patent protection for their work, versus major software firms on the other hand, who wish to maintain the complete proprietary character of their products and rely for that purpose on patent and other intellectual property protections. However, to a significant degree, the opposite has happened. Even major incumbent firms have seen the benefit of sharing in unrestricted use of a common pool of copyrighted and patented works for which they are willing to waive their patent enforcement rights against other contributors to the common pool. These firms include IBM, Sony, Philips, Red Hat and Google, which belong to an organization called the Open Invention Network. IBM and Red Hat are major vendors of products that incorporate open source software. They make a significant portion of their money from the service side of their business. Indeed, IBM, the world's largest ICT patenting firm in 2005, was very active in multiple facets of the ICT portfolio described in Figure 1. And RedHat, which has consistently taken the position that patents generally impede innovation in software, now takes the more nuanced view that

“...we are forced to live in the world as it is, and that world currently permits software patents. A relatively small number of very large companies have amassed large numbers of software patents. We believe such massive software patent portfolios are ripe for misuse because of the

questionable nature of many software patents generally and because of the high cost of patent litigation. One defense against such misuse is to develop a corresponding portfolio of software patents for defensive purposes.” (RedHat.com / RedHat Patent Policy, 4/7/2008).

In his article concerning the commercialization of open source software, Mann (2006) discusses how established firms, which want to benefit from access to open source software in order to use the code as interoperable commoditized building blocks for their own products and services, have become big players in the open source arena. As a result, they have contributed some of their own patents to the common pool. All contributors to the pool – large and small – agree to cross-license open source related patents to all other contributors at no charge. This cumulative shared portfolio then gives the participating patent owners the ability to negotiate access to other patented technologies and defuse potential litigation through further cross-licensing arrangements. The effect, in Mann’s words, is to use “combined patent portfolios to create fences around (at least) some open source technologies” (p. 28). These fences provide some measure of protection for all contributors from the uncertainty that an investment of resources in an innovative project could yield nothing more than a ripe target for a patent infringement suit. Instead they can freely collaborate on more innovative projects.

Mann (2006) further explains that the deterrents against patent infringement suits that have been built into open source license provisions create “incentives of various degrees designed to deter users of the program from instituting patent litigation by the threat of withdrawing further rights to use the open source program”(p. 19).

In short, the large incumbent firms participating in the common pool are providing significant heft to open source by (1) agreeing not to assert their patent rights against users of Linux and other open source code who similarly agree to grant such waivers with

respect to their own patents and (2) using their own patents in counterclaims against those firms who insist on pursuing go-alone strategies that rely heavily on aggressive patent litigation to enforce their own patents. In this sense, we are witnessing a movement toward convergence of interests between the open source and patent regimes.

This does not mean that open source software participants will be immune from patent infringement litigation. A lawsuit was filed in October 2007 against Red Hat and Novell by a non-participating patent holding firm, which claimed that its patents were infringed by various Linux-based products. And Microsoft, which does not participate in the common pool under the GPL open source license, has threatened to bring patent infringement suits against Linux vendors such as Red Hat. Parloff (2007) notes that Microsoft has claimed that approximately 235 of its patents are allegedly being infringed by open source code, including:

- 42 Microsoft patents allegedly infringed by the Linux kernel;
- 65 Microsoft patents allegedly infringed by the Linux user interface; and
- 15 Microsoft patents allegedly infringed by free e-mail programs.

Microsoft has not identified specifically which of its patents are allegedly being infringed or how such infringement is supposedly taking place.

Nevertheless, even Microsoft has pursued some level of co-existence with portions of the open source community. For example, it has chosen to team up with Novell (which, like Red Hat, is a participant under the GPL open source license) to share their respective patent portfolios on a bilateral basis. Moreover, Microsoft's Shared Source Initiative, which gives licensees the right to review and in some cases modify its source code for several of its platform products, represents an example of a trend on the part of firms

producing proprietary software seeking to open up their own platforms and obtain in return the benefits of the open source model (Hahn 2002; Rao, Klein and Borg 2006). Microsoft was also a participant and sponsor of the 2007 Government Open Source Conference, which was designed to help IT management see how open source software might fit into software acquisition or development strategies. Such increasing acknowledgment, even on the part of a traditional adversary of open source, that OSS and proprietary software both have important complementary roles to play in today's more user-centric environment, is also reflected in expert opinion on public policy toward OSS (Table 2).

If Microsoft should decide to go through with its threat to bring patent infringement suits against Linux vendors and users, it could face massive well-financed countersuits against its core Windows product by the coalition of powerful firms comprising the Open Invention Network.

Innovation by Lead Users

Google is a major user of open source software in its internal systems as well as in its online services, which generate substantial revenue for Google from Internet advertising. As such Google has a strong incentive to contribute to OSS innovation. Google fits well von Hippel's (2005) definition of lead users as members of a user population having two distinguishing characteristics: (1) they are ahead on an important market trend and are currently in need of solutions long before many users need them; (2) they expect to derive relatively high benefits from obtaining a solution to their needs, and so they innovate. Morrison et al. (2004) found significant correlation between the two defining characteristics of lead users and the likelihood that they will innovate. Moreover, as

shown in Figure 2, Franke and von Hippel (2003) found that the higher the intensity of lead user characteristics displayed by an innovator, the greater the commercial attractiveness of the innovation that the lead user develops.

The open source tide is also beginning to sweep over the wireless telecommunications market. Google has spearheaded a group of more than thirty large corporations – including high technology companies and mobile carriers – to join an organization called Open Handset Alliance. The chip makers Intel and Qualcomm, handset maker Motorola, wireless carriers T-Mobile and Sprint Nextel, and e-commerce provider eBay are among the members. They are committed to fostering an open Linux-based platform that allows the development of diverse but interoperable mobile handset applications. Google calls this platform “Android”. The objective is to accelerate the ability of wireless customers to tap into the Internet for software, content, and services the way they can from their personal computers.

Just like their open source software counterparts with whom Google has also associated, participants in the Open Handset Alliance will contribute intellectual property to a common pool on a royalty-free basis. This convergence of patent protection and open source could yield more innovative wireless offerings on handset devices as firms competing at the top application layer know that their features will be interoperable with other features built on the same open platform and that they will be able to innovate under the protective umbrella of the contributed patents. Participating wireless carriers will ensure that any handset device built on the Android platform will be able to run on their networks. Google intends to offer access to its online services via the wireless

handsets, and to share its advertising revenue with participating carriers as an incentive to encourage as many carriers as possible to join the Open Handset Alliance.

Success will depend on whether and to what extent the largest incumbent wireless carriers such as AT&T and Verizon mobile operators will allow the open devices on their networks. This would require a major shift in thinking for carriers that are used to deciding what applications and features appear on the handsets that can utilize their networks.

There is some reason for cautious optimism as both AT&T and Verizon have issued statements in support of Google's open source initiative and have expressed their willingness to cooperate. In winning the auction held by the Federal Communications Commission in March 2008 for a nationwide wireless license to use the C-block 700MHz spectrum, Verizon agreed to a set of open access rules that would allow any devices or applications meeting published technical standards to operate on an open network utilizing this spectrum. Verizon could attempt to manipulate these standards to its advantage, but will face well-financed opposition before the FCC if it tries to go too far.

Microsoft may also pose a challenge to the fully open mobile platform. Microsoft's CEO Steve Ballmer has publicly dismissed Android as the equivalent of vaporware. Yet that bit of bravado may mask real concerns on Microsoft's part. The question is whether Microsoft will try to protect its Windows Mobile business and put up roadblocks to its arch rival Google's plans for the Android open platform by employing strategies similar to those that it has used in connection with Linux software generally – a combination of threats of patent infringement litigation and some degree of co-existence with portions of the open source community. However, if Microsoft or other similarly inclined patent

owning firms pursue a litigation strategy against developers and users of mobile applications running on the open Android platform, they may well face countersuits by the Open Handset Alliance members as well as alienate some of their major customers who are users of open source.

In terms of the future direction of mobile service innovations, the jury is still out. However, Google's Android initiative could take off once there is a critical mass of participants - including the major carriers and users. That may take some time to reach.

Charles Golvin, an analyst with Forrester Research put it this way: "The long-term potential impact is to drive the same kind of innovation that we see on the Internet into the mobile environment. But it's a convoluted environment and it will take a long time." (Reardon and Krazit 2007).

Concluding Remarks

This paper has analyzed why the conventional wisdom that draws a sharp dichotomy between the closed proprietary intellectual property model and the open source model is misplaced. In fact, there is a convergence of interests that lead patent holding producers of innovation and the open source community to leverage each other's strengths. Even dominant firms like Microsoft, which have been reluctant in the past to open up their proprietary innovations to users and competitors, have come to recognize that they must co-exist with the open source model of innovation in order to succeed. This will be particularly important for producers of products and services as innovation by users, especially lead users, become a more important element of the OSS innovation process. As Weber (2004) notes, the open source process scrambles the conventional categories of

producers and consumers. Google is a classic example of this blending phenomenon. Weber suggests that users are integrated into the production process in a profound way as “the incentives grow to shift the locus of innovation closer to them by empowering them with freely modifiable tools.” (pp 265-267). We expect that the next frontier for this trend to play out will be mobile telephony.

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Table 1 Open Source Licence Share of Projects

License	Share
GNU General Public Licence	69.26%
GNU Library or Lesser General Public Licence	11.46%
BSD Licence	7.29%
MIT Licence	1.86%
Artistic Licence	1.85%
Apache Software Licence	1.43%
Mozilla Public Licence 1.1	1.31%
Apache Licence V2.0	0.86%
Common Public License	0.79%
Zlib/libpng Licence	0.52%
Open Source Licence	0.48%
Academic Free Licence	0.36%
Mozilla Public Licence 1.0	0.36%
Qt Public Licence	0.33%
PHP Licence	0.23%

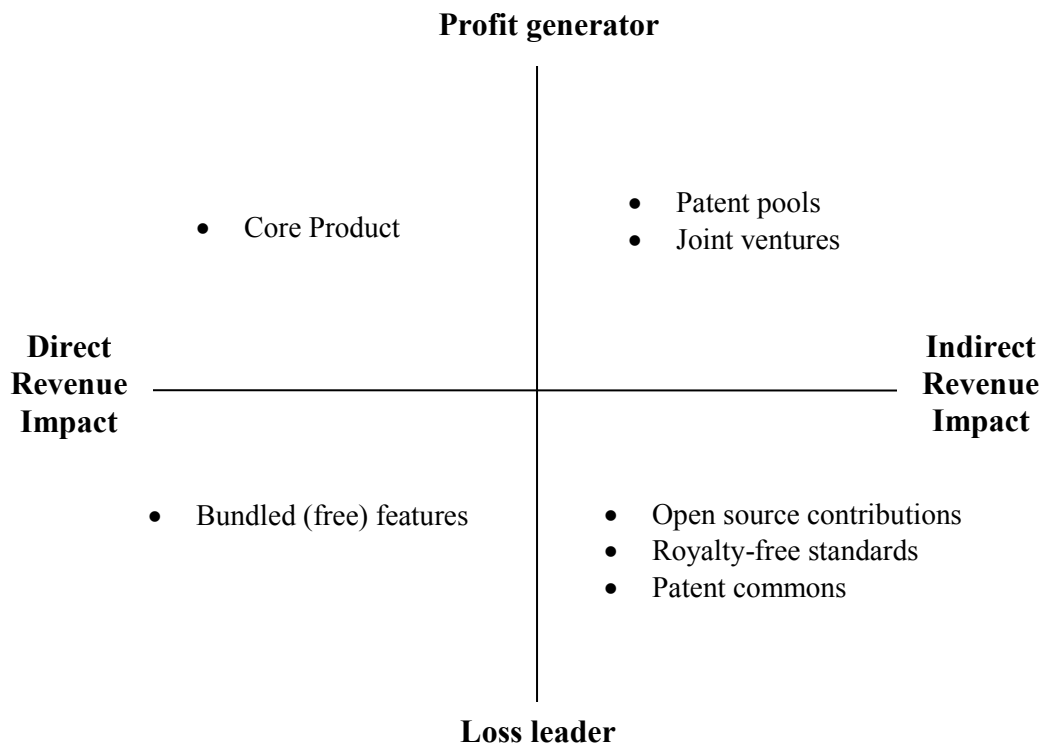
Source: Forfás (2006).

Table 2 Expert viewpoint on Government Policy toward Open Source Software

Issue	Expert Viewpoint
• Significant market failure in the development of open source software (OSS).	qualified “No”
• Direct government subsidies for OSS.	No
• OSS and proprietary software have important roles to play.	Yes
• Government should make software procurement based on cost-benefit analysis similar to a profit –maximizing firm.	generally “Yes”
• Government should encourage firms to commercialize R&D by not permitting GPL or “viral” license to be used in government-funded research.	no consensus
• Government should change patent policy to allow open source to be more competitive.	no consensus

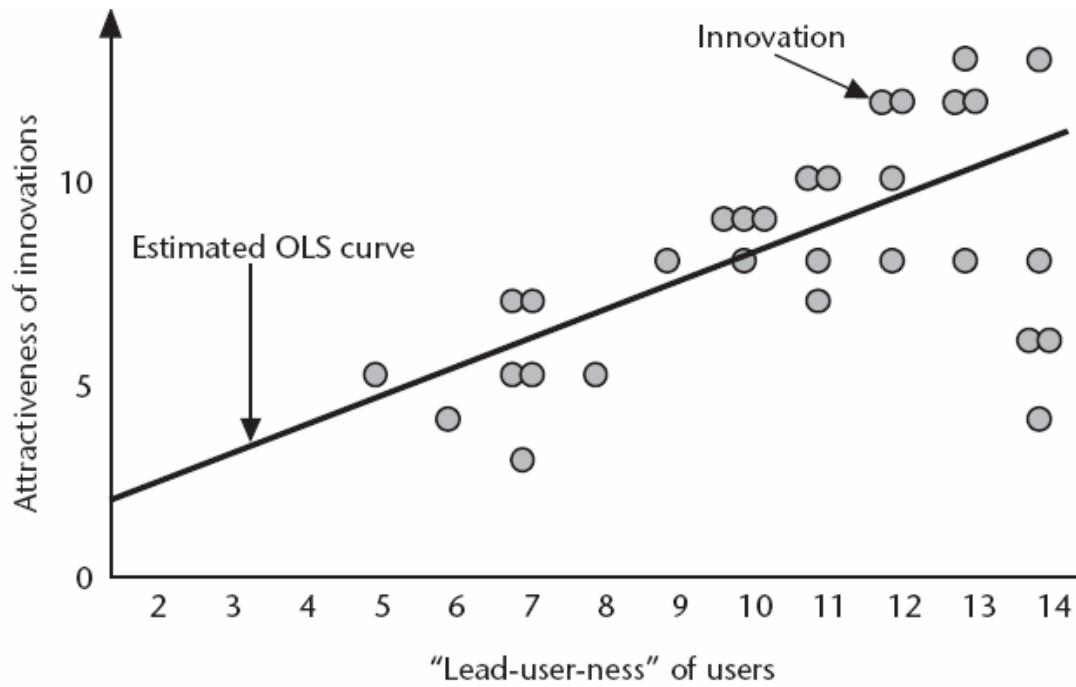
Source: Adapted from Hahn (2002).

Figure 1 Possible Approach to Managing the Overall IP Portfolio



Source: Forfás (2006).

Figure 2 Relationship between “Lead-user-ness” and Attractiveness of Innovations



Source: Adapted from Franke and von Hippel (2003).