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Business Method Patents, Innovation, and Policy

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Abstract

The trickle of business method patents issued by the United States Patent Office became a flood after the State Street Bank decision in 1998. Many scholars, both legal and economic, have critiqued both the quality of these patents and the decision itself. This paper discusses the likely impact of these patents on innovation. It first reviews the facts about business method and internet patents briefly and then explores what economists know about the relationship between the patent system and innovation. It concludes by finding some consensus in the literature about the problems associated with this particular expansion of patentable subject matter, highlighting remaining areas of disagreement, and suggesting where there are major gaps in our understanding of the impact of these patents.

Keywords: intellectual property, State Street, software, internet; business methods, patents, innovation

JEL Classification: . K3, O0, L4

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1 *Introduction*

The explosion in business method patent applications and grants that occurred in 1999-2001 has abated somewhat, but the many policy questions raised by the response of the financial, e-commerce, and software industries to the well-known State Street Bank decision on the patentability of business methods remain. Many scholars, both legal and economic, have written on this topic and to a great extent it is possible to discern some points of agreement in their arguments.[2] Although much of this literature provides a fairly thorough analysis of individual cases and what they signify, there is relatively little literature on the impact of business method patents that is based on a more broad-based or empirical approach.

The current paper does what it can using available sources to fill the gap by reviewing some of the literature on patents in general in an attempt to infer the implications of this literature for business method patents. The focus is on two issues: the role of patents in encouraging innovation and the consequences of low patent quality. I begin by reviewing the facts about business method patents briefly, and then survey what economists know about the general relationship between patent systems and innovation, in order to draw some implications for the likely impact of business method patents on innovation in industry. A discussion of the patent quality issue is followed by a summary of the policy recommendations made by those who have followed the evolution of legal standards as both software and business methods have

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[1] University of California at Berkeley and NBER. Paper prepared for the Atlanta Federal Reserve Bank Conference on Business Method Patents, Sea Island, Georgia, April 3-5, 2003 and the EPIP Network Conference on New Challenges to the Patent System, Munich Germany, April 24-25, 2003. Comments from participants in those conferences are gratefully acknowledged. Thanks to Stuart Graham for giving me patent data updated to the end of 2002 in a very timely mannyer.

[2] See, for example, Bakels and Hugenholtz (2002), Bessen and Maskin (1997), Blind et al (2001), Cockburn (2001), Cohen and Lemley (2001), Davis (2002a,b), Dreyfuss (1999), Hart *et al* (1999), Hunt (2001), Kasdan (1999), and Lerner (2001).

become acceptable subject matter. The paper concludes with a brief discussion of the one of the chief recommendations, an enhanced post-examination patent review system.

Most economists view the patent system as a necessary evil: with a patent grant we trade off short term exclusive (monopoly) rights to the use of an invention in return for two things: 1) an incentive to create the innovation; and 2) early publication of information about the innovation and its enablement. The argument is that without the patent system, fewer innovations would be produced, and those that were produced would be kept secret as much as possible to protect the returns from misappropriation. Mazzoleni and Nelson (1998) expand on this analysis and provide two further related arguments for the existence of a patent system: it serves as an inducement for the needed investments to develop and commercialize inventions, and it enables the "orderly exploration of the broad prospects" opened up by particularly novel inventions. In considering the economic impacts of the implicit subject matter extension implied by the increased use of patents to protect business methods, the tradeoff between these benefits and the welfare cost of the grant of a monopoly right are at least as important as they are in any other technological arena.

Economic analysis says first that ***competition*** may suffer when we grant a monopoly right to the inventor of a business method but it will benefit if this right facilitates entry into the industry by new and innovative firms. Second, ***innovation*** in business methods will benefit from the incentive created by a patent but may suffer if patents discourage the combining and recombining of inventions to make new products and processes. Thus the relationship between patents, competition, and innovation is guaranteed to be a complex one, and one that may vary over time and across industries. Table 1 summarizes these trade-offs.

2 Background and history

There is no precise definition of a business method patents, and in reading the literature it becomes clear that many scholars make little distinction between business method patents, internet patents, and software patents more broadly, at least when making policy recommendations. This is inevitable in the present day, because many business method patents are in fact patents on the transfer of a known business method to a software and/or web-based implementation, so the distinction is hard to maintain. The USPTO defines a business method patent narrowly, as a patent classified in US patent class 705, defined as "data processing:

financial, business practice, management, or cost/price determination." Such patents are on methods used for a variety of purposes in business such as the following:[3]

- Financial - credit and loan processing, point of sale systems, billing, funds transfer, banking clearinghouses, tax processing, and investment planning
- Financial instruments and techniques – derivatives, valuation, index-linking
- Optimization – scheduling and resource allocation
- Marketing - advertising management, catalog systems, incentive programs, and coupon redemption
- Information acquisition, human resource management, accounting, and inventory monitoring
- e-commerce tools and infrastructure – user interface arrangements, auctions, electronic shopping carts, transactions, and affiliate programs
- Voting systems, games, gambling, education and training

Examples of business method patents are the well-known one-click patents assigned to Amazon.com, the Dutch auction patent of Priceline.com, and of course the Signature Financial patent on a system of managing multiple mutual funds in a single account. Table 2 lists a number of such patents that have been involved in disputes or controversy, either litigation, re-examination, or attempted enforcement via licensing letters. Many such patents are patents on methods of doing business on the internet.

It is of course possible that patents we might view as business method patents are classified elsewhere in the patent system. For example, patent number 5,854,117, which describes a training system for training janitors, is classified as 434, "education and demonstration." Patent classes that contain business method patents, as broadly defined by other researchers, are shown in Table 3. Some of these classes contain only a few such patents, e.g., class 84, music, which contains a patent on a method of teaching music, US patent number 6,015,947.

Figure 1 gives an idea of the relative importance of software and business method patents according to various patent class definitions. Under a broad definition of software/business methods, the USPTO is now granting about 10 to 12 thousand patents per year, as opposed to

[3] See the USPTO White Paper (1999) for further description and categorization of these patents.

fewer than a thousand before 1985. Pure business method patents (those in class 705) are still a small share of the total, with fewer than 1000 granted per year, and with a notable decline in grants in 2001 and 2002 because of the second review of this class that was instituted by the USPTO.[4] The number of actual financial services patents issued (subclasses 35-38 and 4 of class 705, plus class 902) is minuscule through December 2002.[5]

As the low numbers of some of the classes indicate, business method patents of some sort have existed for a long time, although not necessarily in large quantities. According to the USPTO (1999), the earliest business method patents were for methods of printing money and detecting counterfeit bills.[6] A patent was issued in 1857 for the idea of including local advertising in a hotel register. Recently the numbers have increased substantially, largely due to a couple of major court decisions. Nevertheless, they are still on the order of one percent of all patents applied for (USPTO 1999).

Statutory subject matter for patenting is defined by section §101 of the U.S. code as any new and useful machine, article, process, or composition of matter. Precedents set during the long legal history of patentability have interpreted this definition to exclude laws of nature, natural phenomena, and abstract ideas. It is presumably the shades of difference in meaning between the definition of a "new and useful process" and an "abstract idea" that is the source of the debate surrounding business methods as a suitable subject matter for patentability.

In any case, the courts (in the person of Judge Rich) have now spoken, in State Street Bank and Trust v Signature Financial Corporation.[7] The Signature patent at issue was a "pure"

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[4] In discussion of this paper, Josh Lerner suggested that the decline may be partly due to strategizing on the part of firms to avoid having a potential business method patent classified into 705, so that it would not be scrutinized twice at the USPTO. This seems likely, but there is no way to measure this effect using publicly available data.

[5] Although class 902 seems from its description to be a likely repository of many financial services patents, in fact only one such patent classified in 902 had been granted by the end of 2002, which is when my data sample ends. Most such patents are in class 705.

[6]The first financial patent was granted on March 19, 1799, to Jacob Perkins of Massachusetts for an invention for "Detecting Counterfeit Notes." Patent number X2301 was granted to John Kneass on April 28, 1815 for a "A Mode of Preventing Counterfeiting." The hotel register patent is number 63,889. See USPTO (1999).

[7] State Street Bank and Trust Co., Inc. v. Signature Financial Group, Inc., 149 F.3d 1368 (Fed. Cir. 1998).

number - crunching type of application, which implemented financial accounting functions.[8] The Federal Circuit Court decision stated clearly that Section 101 is unambiguous - "any" means ALL, and it is improper to read limitation into 101 not intended by Congress. Therefore, mathematical algorithms are non-statutory only when "disembodied" and thus lacking a useful application. The court went on to make sure that the decision was precedent-setting by stating that with regard to the business method exception, "We take this opportunity to lay this ill-conceived exception to rest."

In AT&T v Excel, where the patent at issue contained a method claim about adding a data field to a record for use in a billing system, the Federal Circuit confirmed the State Street decision, saying that a physical transformation was not required for a method claim to be statutory and that mathematical algorithms were patentable if "embodied" in an invention. That is, the State Street decision applies to methods as well as to machines.

The success of the patentholder in these two cases has clearly emboldened others who hold patents on internet-based methods of doing business. Table 2 lists some of these patents: they include the well-known one-click patent of Amazon, the Priceline name-your-price auction, and the widely critiqued Y2K windowing patent.[9] Currently in litigation are the "Stambler" patents, which are claimed to cover the SSL public key encryption methodology widely used by secure websites. Recently SBC has attempted to collect license revenue from an broad patent for a structure document browser. MercExchange has sued e-Bay for infringement of a series of patents on computerized marketplaces. Many of the past cases have ended in some kind of

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[8] The description of the patent in the court's decision was that it was "generally directed to a data processing system (the system) for implementing an investment structure which was developed for use in Signature's business as an administrator and accounting agent for mutual funds. In essence, the system, identified by the proprietary name Hub and Spoke, facilitates a structure whereby mutual funds (Spokes) pool their assets in an investment portfolio (Hub) organized as a partnership. This investment configuration provides the administrator of a mutual fund with the advantageous combination of economies of scale in administering investments coupled with the tax advantages of a partnership."

[9] This author was one of many who was incredulous when this patent, which solves the Y2K 2-digit year problem by redefining the base year, issued. Like some others, she had software (in this case, TSP) on the market using this method a good 15 years before patent 5,806,063 was applied for. The Patent Commissioner ordered a re-examination of this patent in 1999, but the outcome of this re-exam has not yet been reported on <http://www.delphion.com>. Note that the USPTO does not report re-exam status on its website.

settlement with undisclosed terms, so it is difficult to form a precise picture of the licensing royalties involved. It is, however, noteworthy that most of the cases concern internet patents rather than "pure" business method patents. Following Lanjouw and Schankerman (2001), this suggests that these are the high value and enforceable patents in this area. The more frivolous business method patents (such as 6,257,248, for cutting hair with scissors in both hands) are probably unenforceable.

According to the TRIPS agreement of the WTO, neither business methods nor software are specifically excludable subject matter for patentability (Diallo 2003). With respect to software, national treatment varies, but in most countries at least some types of software (especially those with a "technical effect" or where they are embodied in hardware) are now patentable.[10] At the present time, business methods are patentable in the United States, Australia, Japan, and Korea, but not in Europe including the UK, and Canada. Therefore it would be interesting to ask whether this difference in patenting systems has made any difference for business method and internet innovation in the two sets of countries. Unfortunately, this particular research has not yet been undertaken, probably because it is still too early for there to be much evidence. Thus in the next section of the paper I review the limited empirical evidence on the effects of having a patent system on innovation in general.

3 *Does the patent system increase innovative activity?*

Although almost the holy grail of innovation policy research, this question has proved exceedingly difficult to answer due to the absence of real experiments. As I suggested in the introduction, economic theory does not supply an unambiguous answer to the question, so that it is essential to rely on empirical observations where a patent system has been introduced, eliminated, or changed in major ways. In this section of the paper, I first review the theoretical results briefly and then turn to the empirical evidence on innovation and the patent system.

3.1 Theoretical results

The first result from theory is the well-known argument that granting a patent on an innovation will both incent the inventor, raising welfare, and create a temporary monopoly with

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[10] See Spindler (2003) for a useful discussion of the current state of play in Europe, and EC (2002) for the draft European directive on software patent policy.

its attendant deadweight loss. This rather stark result is mitigated somewhat by two observations: the first is that inventors are often motivated by a variety of factors, not all of which are financial. The second is that innovators are often creative in securing returns to their inventions even in the absence of a patent by bringing it to the market speedily and by secrecy. Based on these observations, we might expect the patent system to be an important incentive system when 1) considerable funds are needed to develop an invention, as in the case of pharmaceuticals or complex modern information technology, and 2) it is difficult to keep the innovation secret, or imitation is easy.

More recently, a number of theorists beginning with Scotchmer (1991) and Green and Scotchmer (1995) have stressed the negative effects of patenting in industries with cumulative or sequential technology where each innovation builds on the last, as well as the impossibility of getting the incentives right unless there is enough information to enable contracts to be written before the first invention. Incentives to develop follow-on innovation in these industries are reduced by the need to pay licensing fees to the earlier inventors. In principle, for industries with very complex technologies, the problem of contracting for many small pieces of technology may be so severe that transactions costs discourage invention altogether (Heller and Eisenberg 1998; Grindley and Teece 1997).

For my purposes here, the work of Hunt (1991) is probably the most directly appropriate. He modeled the phenomenon of sequential innovation with a variable standard of patentability (non-obviousness) and asked how a patent system is likely to impact innovation in this case. He assumes an environment where the profitability of inventions is continuously eroded by the introduction of new, competing technologies and where the strength of the nonobviousness requirement for obtaining a patent determines the proportion of new discoveries that do not affect the profits earned by older proprietary discoveries. He then analyzes the consequences of lowering the nonobviousness requirement, showing that there are two competing effects: a static effect in which R&D incentives are increased because more inventions are patentable and a dynamic effect in which incentives are decreased because the profit from any given invention is lower since it will be replaced more quickly.

Two conclusions are drawn from this analysis: 1) there exists a unique standard of nonobviousness that maximizes the rate of innovation in a given industry; and 2) contrary to the conventional wisdom, reductions in the nonobviousness requirement are more likely to encourage innovation in industries that innovate slowly than in industries that innovate rapidly. The implication is that in rapidly innovating industries where each new product builds on others, welfare is more likely to be enhanced by having a high hurdle for obtaining a patent. O'Donoghue (1998) uses a slightly different model of sequential innovation and draws a similar conclusion, that increasing the standard of patentability can increase R&D as firms go after larger innovations, even though the overall cost of obtaining a patent has risen.

As a general rule, the theoretical work discussed here has abstracted from the frictions introduced by uncertain patent validity, transaction costs such as those needed to negotiate licenses, and the costs of litigation for infringement and validity that arise either because of bargaining breakdown or real uncertainty about the patentability. Yet there is considerable anecdotal and some empirical evidence (e.g., Lerner 1995) that these frictions can be an important component of the cost of a patent system, and hence more patents or lower quality patents may be a drag on innovation because they increase transactions costs without increasing innovation incentives.

3.2 Empirical evidence

Most researchers who have investigated the question of innovation and the patent system empirically have looked at historical eras when there were changes to the system and examined the consequences for subsequent innovative activity. Recently there have emerged a pair of studies that use mainly 19^{th} century data (when there was substantial variation across countries in patent systems). One uses invention data from World's Fairs and Expositions and one uses patenting itself as the innovation measure.

In a dissertation written at the University of California at Berkeley, Moser (2002) finds that inventors in countries without a patent system do not innovate more than inventors in countries with patent systems. However, inventors in countries without patent systems do tend to innovate in areas that are more easily protected with trade secrecy. Lerner (2002) finds that when a country strengthens its patent system, inventors from other countries patent more in that country. However, inventors from the country itself do not appear to invent more – they neither patent more in their own country, nor in Great Britain (which was chosen as a reference country, because it was a very important market in the 19^{th} century and one with a well-functioning patent system that was widely used).

Results using data from the 20th century are harder to find, but survey evidence exists. The Carnegie-Mellon and Yale surveys (Cohen et al 2000 and Levin et al 1987) demonstrate fairly clearly that patents are NOT among the important means to appropriate returns to innovation, except perhaps in the pharmaceutical industry. Similar results have been obtained by other researchers for Europe and Japan. Arundel (2001) reports the results of the PACE survey of large European firms, accounting for more than 75% of the patenting in Europe. In both the United States and Europe, firms rate superior sales and service, lead time, and secrecy as far more important than patents in securing the returns to innovation. Patents are usually reported to be important primarily for blocking and defensive purposes.

Using a somewhat more complex economic model and the same survey evidence, Arora, Ceccagnoli, and Cohen (2001) find that increasing the patent premium, which they describe as the difference in payoffs to patented and unpatented inventions, does not increase R&D much except in pharmaceuticals and biotechnology.

The most positive results are those from Park and Ginarte. In a 1997 paper using aggregate data across 60 countries for the 1960-90 period, they find that the strength of the IP system (an index based on coverage, especially whether pharmaceuticals are covered; membership in international agreements; lack of compulsory licensing and working requirements; strength of enforcement; and duration) is positively associated with R&D investment in the 30 countries with the highest median incomes (that is, G-7 and other developed countries, mostly in Europe). In the other countries, the relationship is positive but not significant. Unfortunately their estimates are cross-sectional and not corrected for the simultaneity (reverse causality) between doing R&D and having a patent system, which may explain why they are so different from those of Moser and Lerner.

Sakakibara and Branstetter (2001) studied the effects of expanding patent scope in Japan in 1988. According to the Japanese firms and patent attorneys that they interviewed, a statutory change that allowed multiple claims per patent (as has always been true in the U.S.) had the effect of increasing patent scope in Japan. They found that this change to the patent system had a very small positive effect on R&D activity in Japanese firms.

Hall and Ziedonis (2001) looked at a single industry (semiconductors) that doubled its patenting-R&D rate after the creation of the CAFC and other changes to patent legislation in 1982. Interview evidence suggested that the increase was due to the fact that inventions in this industry use technology that is covered by hundreds of patents held by a number of firms, and that firms increasingly feared litigation and preliminary injunctions if they failed to have cross-licensing agreements in place. Negotiating such agreements was greatly facilitated by having a large patent portfolio of your own, so several firms, large and small, were engaged in defensive drives to increase their patenting rate. This had little to do with encouraging innovation, and in fact looked like a tax on innovative activity. The result also highlights the fact that the one product/one patent model of innovation is very far from the reality in many industries.

Hall and Ziedonis (2001) also noted another effect of stronger patents in the semiconductor industry: it appears to have facilitated the entry of pure "design" firms, those which produce semiconductor designs but do no manufacturing. This fact was supported both by interview evidence (executives reported that patents were important for securing venture capital financing where there were few other assets) and by the fact that the share of design firms in the industry went from approximately zero per cent in 1982 (before the strengthening of the system) to 30 per cent in 1995.

Baldwin, Hanl, and Sabourin (2000) studied this question for Canada. Using the same type of firm-level survey evidence on innovation as in the PACE survey, they find that the relationship between innovation and patent use is much stronger going from innovation to patent use than from patent use to innovation. Firms that innovate take out patents; but firms and industries that make more intensive use of patents do not tend to produce more innovations.

Lanjouw and Cockburn (2000) use new survey data from India, the results of interviews with industry, government and multinational institutions, and measures of R&D activity constructed from a variety of statistical sources to determine trends in the allocation of research to products such as malaria vaccines that are specific to developing country markets. There is some, although limited, evidence of an increase in such research in the mid- to late 1980s which appears to have leveled off in the 1990s. The full effects of TRIPS on research directed to developing country needs remains to be seen.

The conclusions from this survey of empirical work on the effects of the patent system on innovation are several. First, introducing or strengthening a patent system (lengthening the patent term, broadening subject matter coverage, etc.) unambiguously results in an increase in patenting and in the strategic uses of patents. It is much less clear that these changes result in an increase in innovative activity, although they may redirect such activity toward things that are patentable and/or are not subject to being kept secret within the firm. If there is an increase in innovation due to patents, it is likely to be centered in the pharmaceutical and biotechnology areas, and possibly specialty chemicals. Patents in these areas are relatively easy to define, because they are based on molecular formulas, and therefore also relatively easy to enforce.

The most interesting and possibly surprising conclusion is that the existence and strength of the patent system has a tendency to affect the organization of industry, by allowing trade in knowledge and facilitating the vertical disintegration of knowledge-based industries and the entry of new firms that possess only intangible assets. It is very clear that this particular feature of the patent system has been important with respect to business method and internet patents. In many cases, the first step taken by an inventor/entrepreneur with an idea for an internet-based business model is to attempt to acquire a patent on it, and certainly one of the first questions asked by the venture capitalist he approaches for financing is whether the startup owns patents on its technology.

3.3 Implications for business method innovation

What does the body of literature just surveyed have to say about the implications of allowing business method patents on innovation in business methods? The only conclusion that is certain is that allowing business method patents will cause an increase in the patenting of business methods, one we have already experienced. And along with this increase in patenting, especially one that introduces patents of less certain quality, comes an increase in litigation, raising the costs of the system as a whole.

Unfortunately, it is much more difficult to make predictions about the effects of this subject matter expansion on innovation that are not pure speculation. We know that patents are not considered essential for capturing the returns to innovation in most industries, and there seems no reason to think that this one is different. Casual observation suggests that business method patents are not being used to provide innovation incentives as much as they are being used to extract rents *ex post*, but this evidence could be misleading. We do not know whether there would have been as much entry into internet businesses or new financial offerings in the absence of the patent system.

One possible evolution of practice in the banking and financial services industry can be hypothesized, however. This industry depends heavily on secure communication and transactions exchange among banks and brokerage houses, and such communications depend on standards, that is, they depend on different institutions communicating information to each other in exactly the same way. The industry carries out millions of such transactions daily and requires a very high level of accuracy, which implies a need for highly stable common standards. If components of new transactions' standards or particular ways of doing things are patented by many different institutions, it is possible that a situation could develop like that in the semiconductor/computer industry, where it is necessary to have a portfolio of patents for cross-licensing purposes. This in turn may raise the cost of doing business and make it harder for new firms to enter without access to the requisite intellectual property. However, given the central role played by the Federal Reserve Bank as regulator in at least part of the sector, such an outcome will probably be avoided.

4 Patent quality[11]

Many critics of the wave of business method patents in the first couple of years following the State Street decision have pointed to their low quality rather than their existence as the real policy problem (see Barton 2000, Dreyfuss 2001, and other references in Table 4). But what is meant by patent quality? The statutory definition of a patentable invention is that it be novel, non-obvious, and have utility.[12] Both the economic and legal view suggest that high quality patents are those which describe an invention that is truly "new," rather than an invention that is already in widespread use but not yet patented.[13]

Besides the three statutory requirements, a fourth criterion for granting a patent on an invention is that the patent application must disclose sufficient details about the invention. These disclosures in the published patent can facilitate knowledge spillovers to others who might use or improve upon the invention. Another criterion for a "high-quality patent" therefore is that it enable those "skilled in the art" to comprehend the invention well enough to use the patent document for implementation of the described invention. This dimension of patent quality, however, is less likely to be affected by post-grant opposition proceedings.

[11] Parts of this section are drawn from Graham, Hall, Harhoff, and Mowery 2003b.

[12] See Lunney (2001) for an argument that the non-obviousness test has been weakened since the creation of the Federal Circuit Court of Appeals in 1982.

[13] Presumably, if the invention has already been reduced to practice by others, the potential gain from incenting an inventor is zero, so we are left only with the deadweight loss from monopoly.

From a social welfare perspective, an important characteristic of a high quality patent is that there be relatively little uncertainty over the breadth of its claims, i.e., over what specific features of a technical advance are claimed under the terms of the patent, as well as whether these claims are likely to be upheld in legal proceedings following the issue of the patent. Uncertainty about the validity of a patent has several potential costs: such uncertainty may cause the patentholder to underinvest in the technology, it could reduce investment by potential competitors in competing technical advances, and it may lead to costly litigation after both the holder and potential competitors have sunk sizable investments.

4.1 Consequences of low patent quality

Although some scholars, notably Lemley (2001), have argued that the costs of having higher quality patents may exceed the cost, recent experience suggests that there are some unintended consequences in the form of complicating property rights and feedback effects. In this section we review the arguments for increasing patent quality.

”Low-quality patents” can create considerable uncertainty among inventors or would-be commercializers of inventions and slow either the pace of innovation or investment in the commercialization of new technologies. Lerner (1995) has shown that fear of litigation may cause smaller entrant firms to avoid areas where incumbents hold large numbers of patents. Such “entry-avoidance” may be rational and even welfare-enhancing if the incumbents’ patents are known for certain to be valid, but low quality patents held by incumbents may also deter entry into a technological area if the costs of invalidating the patents is too high. In these circumstances, technological alternatives may not be commercialized and consumer welfare suffers.

The lack of relatively rapid processes for resolving patent validity and ensuring higher patent quality also may slow the pace of invention in fields characterized by “cumulative invention,” i.e., those in which one inventor’s efforts rely on previous technical advances or advances in complementary technologies. But if these previous technical advances are covered by patents of dubious validity or excessive breadth, the costs to inventors of pursuing the inventions that rely on them may be so high as to discourage such “cumulative” invention. Alternatively, large numbers of low-quality patents may dramatically increase the level of “fragmentation” of property rights covering prior-generation or complementary technologies, raising the transaction costs for inventors of obtaining access (e.g., through licenses) to these technologies. Finally, the issue of a large number of low-quality patents will increase uncertainty among inventors concerning the level of protection enjoyed by these related inventions, which in turn will make it more costly and difficult for inventors to build on these related inventions in their own technical advances.

The issuance of low-quality patents also is likely to spur significant increases in patent applications, further straining the already overburdened examination processes of the USPTO. A kind of vicious circle may result, in which cursory examinations of patent applications result in the issue of low-quality patents, which triggers rapid growth in applications, further taxing the limited resources of the USPTO, further limiting the examination of individual applications, and further degrading the quality of patents.

Recent decisions by the Court of Appeals for the Federal Circuit (CAFC), the specialized appeals court for patent cases, concerning the validity of "important" patents (those deemed sufficiently valuable by patentholder or competitor to litigate and appeal) create still another reason for serious consideration of a nonjudicial process for post-issue validity challenges. For example, in 2002 the CAFC ruled that the PTO had incorrectly rejected two applications for "obviousness," arguing that if an examiner rejects an application using "general knowledge," that knowledge "must be articulated and placed on the record."[14] According to deputy commissioner Esther Kepplinger, this means "we can't reject something just because it's stupid."[15] This decision could significantly weaken the level of scrutiny provided by the already costly and overcrowded patent-litigation system. A system that enabled third parties (including competitors) to bring such knowledge (in the form of written prior art) to bear on the patent could help in making an obviousness determination. This idea is discussed further in the next section of the paper.

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[14] This decision presumably made it more difficult to reject such patents as US 6368227, the patent on a swinging method that uses a technique known by children for years, but not placed "on the record." Note that this particular patent has been subject to a re-examination request of the U.S. Patent Commissioner because of the publicity it received. The problem with patents like this is not necessarily that they are enforceable in the courts, but that they clog the system and raise its total cost.

[15] As quoted on the Los Angeles Times, February 7, 2003.

5 Survey of policy recommendations

This section of the paper collects and organizes the many policy recommendations with respect to business method, internet, and software patents that have been made by other scholars, in an effort to find a consensus. Table 4 summarizes the recommendations of a number of legal and economic scholars. Several points emerge from this table and from a reading of the papers referenced.

First, there is a remarkable amount of agreement, if not a consensus, that the average quality of patents being issued during the past decade or so is too low, especially in the software and business method areas. There is also some agreement on the reasons: an overburdened patent office, lack of expertise in the relevant areas, lack of prior art databases, and the weakening of the non-obviousness test, partly through court decisions.

Recommendations center on correcting these problems in software and business methods, although many of the suggestions would apply more broadly. Many authors suggest that standards of patentability and non-obviousness should be raised across all technologies, but especially in software and business methods (Barton 2000, 2001, Kasdan 1994, Bakels and Hugenholtz 2002, Lunney 2001, Quillen 2001, Dreyfuss 2001, Meurer 2002).

On the other hand, there is considerable variation in the recommendations with respect to subject matter extensions to software and business methods, ranging all the way from the AIPLA position that business methods receive the same treatment as other technologies to Thomas' 1999 recommendation that subject matter be restricted to "the repeatable production or transformation of material objects." Nevertheless, a number of legal scholars, including Dreyfuss, Meurer, and Bakels and Hugenholtz, have called for reinstatement of the business method exception.

With respect to software, Lemley and O'Brien (1997) and Somaya (2001) have argued that patenting of software may have a beneficial effect if it leads to the reuse rather than the reinvention of software components as a result of patent publication rather than the use of secrecy to protect them. However, Lemley himself, along with Cohen, Warren-Boulton et al (1995), and Samuelson (1995) have recommended both narrow construction of patents for software and limited rights to reverse engineer in order to ensure interoperability and transparent interfaces.

Finally, several authors have endorsed the idea that a greatly strengthened *inter partes* post grant re-examination system modeled on the European opposition system would encourage competitors and other third parties to bring forth prior art, especially in new subject matter areas where the PTO has inadequate searching facilities (Janis 1997, Levin and Levin 2002, Graham et al 2003a,b, Wegner 2001). The primary argument for such a system is that it would lead to invalidity determinations being made earlier and at less cost than the current system, which relies primarily on infringement suits accompanied by countersuits for patent validity. A second argument is that by housing validity determination within the patent office, useful feedback on the performance and accuracy of examination can be generated relatively quickly and communicated at somewhat lower cost than if it is generated by the courts. I refer the reader to Graham et al (2003a,b) for further information on the comparative operation of the *ex parte* U.S. re-examination system and the *inter partes* European opposition system.

6 Conclusions

Broad evidence that the patent system encourages innovation always and everywhere is hard to come by. The patent system does encourage publication rather than secrecy; it is probably good at providing incentives for innovations with high development cost that are fairly easily imitated and for which a patent can be clearly defined (e.g., pharmaceuticals). When innovations are incremental and when many different innovations must be combined to make a useful product, it is less obvious that benefits of the patent system outweigh the costs. Business methods are more likely to fall into the second class than the first.

It is useful to think about recommendations for policy towards business methods patents in two very distinct levels: first, there is widespread agreement among legal scholars that the nonobviousness test has not been applied carefully enough in the case of internet and business method patents and that lack of prior art databases have led to many invalid patents issuing in software and business methods. Second, some scholars go further and argue that business methods per se should be excluded from patentability, Judge Rich not withstanding. Given the number of such patents now outstanding, this outcome is unlikely.

With respect to the former critique, a number of scholars have advanced the use of a strengthened post-grant re-examination system in order to encourage third parties to bring prior art to the attention of the patent office. Although the PTO recently strengthened the examination process with respect to these patents (USPTO 1999), some believe that this proposal still has some merit, especially if it could be used to weed out patents in these areas that were issued prior to the administrative changes at the patent office.

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TABLE 1

The Patent System Viewed by a Two-Handed Economist

Effects on:	Benefit	Cost
Innovation	creates an incentive for research and new product/process development; encourages the disclosure of inventions	impedes the combination of new ideas & inventions; raises transaction costs for follow-on innovation
Competition	facilitates the entry of new (smal)l firms with a limited asset base or difficulties obtaining finance	creates short-term monopolies, which may become long-term in network industries, where standards important

TABLE 2
Selected Software and Business Method Patent Disputes

Patent number	Patent class	Issue Date	Description	Plaintiff	Defendant	Date Filed	Court	Date Outcome of Action	Outcome
					Infringement Suits				
4873662	711	1989	Hyperlink prototype patent	BT	Prodigy (AOL, etc)	Dec 2000	New York	Sept 2002	Summary judgement; patent not valid; BT abandoned patent
5193056	705/36	1993	Data processing system for hub and spoke financial services configuration	State Street	Signature Financial			1998	State Street prevailed; business methods are patentable
5267314	713	1993	Public key encryption (SSL)	Leon Stambler	RSA Security, Verisign, etc	Feb 2001	Delaware		Trial began 2/26/03
5333184	379	1994	Call message recording for telephone systems (use of an algorithm to assing billing codes of IXCs in customer's records)	ATT	Excel Communications	1998		April 1999	CAFC reversed summary judgement, remanded to district court
5845265	705/37	1995	computerized market place for goods	MercExchange	eBay, Return Buy	Sept 2001	VA, Eastern		still in litigation; ReturnBuy settled for non-exclusive license in Dec. 2002, details not disclosed
5774870	705/14	1998	Online incentive/award systems	Netcenter	Carlson Companies; others		CA, Northern		14 licensees with royalties of $6,000,000 per year collected by Netcenter
5794207	705/1	1998	(Dutch auction) method and apparatus for cryptographically assisted commercial network system designed to facilitate buyer-driven conditional purchase offers	Priceline/Walker Digital	Microsoft/Expedia	Oct 1999	Connecticut	Jan 2001	Settled with undisclosed royalty payments
5960411	705/26	1999	One-click internet shopping	Amazon.com	Barnes and Noble	Oct 1999	Washington	Mar 2002	Settled with royalties to Amazon.com
6009412	705/14	1999	online incentive/award systems	Netcentives/Netcenter	Carlson Companies; others		CA, Northern		14 licensees with royalties of $6,000,000 per year collected by Netcentives
6085176	705/37	2000	Use software search agents to comb multiple marketplaces	MercExchange	eBay	Sept 2001	VA, Eastern		still in litigation
6202051	705/27	2001	Automated auctions	MercExchange	eBay	Sept 2001	VA, Eastern		still in litigation
5897620	705/5	1999	(Dutch auction) method and apparatus for the sale of airline-specified flight tickets	Priceline/Walker Digital	Microsoft/Expedia	Oct 1999	Connecticut	Jan 2001	Settled with royalties not disclosed.
					Re-examination Requests				
5806063	707	1998	Y2K century windowing	McDonnell Douglas/Bruce Dickens		1999			Licensing letters 1999-2000; USPTO re-examined at inventor and PTO request, no outcome as of Feb. 2003
6368227	472	2002	swinging a swing sideways or in a circular motion instead of back and forth by pulling on the chains	Steven Olson		2003			USPTO-requested re-exam; no outcome noted.
					Licensing Letters Requesting Royalties				
4698672	375	1986	JPEGlike compression standard	Compression Labs/Forgent		July 2002			Sony licensed the patent for $15M, other licenses have been asserted. The JPEG committee claims prior art invalidates the patent
5241671	707	1993	Multi-media search sustem with multiple paths (broad claims)	Compton's Encyclopedia / Britannica				July 2003	Re-examined at PTO request Dec/93, certificate issued July 2002 (!), with narrowed claims
5933841, 6442574	715 (was 707)	1999	Structured document browser	SBCommunications/Ameritech	30 licensing letters	Feb 2003			prior art: Netscape 2.0 (1995); OWL International (1988) - first commercial hypertext system

TABLE 3
Patent Classes with Software or Business Method Patents

Class	Description
	Not Included on Figure 1
84	Music
119	Animal Husbandry
379	Telephonic Communications
434	Education and Demonstration
472	Amusement Devices
	Included on Figure 1
380	Cryptography
382	Image Analysis
395	Information Processing System Organization
700	Data Processing: Generic Control Systems or Specific Applications
701	Data Processing: Vehicles, Navigation, and Relative Location
702	Data Processing: Measuring, Calibrating, or Testing
703	Data Processing: Structural Design, Modeling, Simulation, and Emulation
704	Data Processing: Speech Signal Processing, Linguistics, Language Translation, and Audio Compression/Decompression
705	Data Processing: Financial, Business Practice, Management, or Cost/Price Determination
706	Data Processing: Artificial Intelligence
707	Data Processing: Database and File Management, Data Structures, or Document Processing
709	Electrical Computers and Digital Processing Systems: Multiple Computer or Process Coordinating
710	Electrical Computers and Digital Data Processing Systems: Input/Output
711	Electrical Computers and Digital Processing Systems: Memory
712	Electrical Computers and Digital Processing Systems: Processing Architectures and Instruction Processing (e.g., Processors)
713	Electrical Computers and Digital Processing Systems: Support
715	Data Processing: Presentation Processing of Document
717	Data Processing: Software Development, Installation, or Management
902	Electronic Funds Transfer

TABLE 4
Recent Recommendations on Patent Policy

Author(s)*	Date	Type	Recommendation(s)
Dreyfuss	2001	business method	Prior art search weak; generates low quality patents; Costs of business method patents greatly exceed benefits and they should be statutorily excluded
Meurer	2002	business method	PTO and the courts should use the subject matter and nonobviousness standards for patentability to limit grants of business method patents. Favors reversal of State Street and restoration of the business method exception. Short of reversal, argues for a narrow reading of State Street and rigorous application of the nonobviousness standard.
Lunney	2001	business method	Federal circuit has gone too far in loosening non-obvious test, requiring written documentation. Should limit e-commerce patents to those that are very creative (i.e., raise patentability standards)
AIPLA	2000	business method	Recommends that business methods with useful, concrete or tangible results, including Internet- and software-implemented business methods, receive the same treatment as other technologies. Where implemented in software, business method patent applications should be examined as software-related applications are examined today for compliance with 35 USC 101,102,103
Thomas	1999	business method	Restrict patentable advances to the repeatable production or transformation of material objects, and exclude subject matter founded upon the aesthetic, social observation or personal skill. Consistent with TRIPS, the industrial application requirement would restore a sense of patentable subject matter that matches our sensibilities.
Wegner	2001	business method	Favors opposition system modeled on Europe and Japan, also designated trail courts for patent cases
Bakels and Hugenholtz	2002	software	1) Stronger inventive step test; 2) Exclude Business Method patents "as such"; 3) Create a European Patent Observatory to monitor system performance
Cohen and Lemley	2001	software	1) Limited right to reverse engineer patented programs, in order to duplicate unprotected elements; 2) Courts should enforce doctrine of equivalents narrowly for software
Somaya	2001	software	Software components should be reused, as in Lemley and O'Brien
Lemley and O'Brien	1997	software	Software patents will encourage the reuse of software components, because trade secrecy no longer necessary.
Dam	1995	software	Software patents sound, although badly adminstered by PTO. Sui generis protection for software not desirable
Samuelson	1995	software	Recommends limited protection for software interfaces (sui generis)
Warren-Boulton, Baseman, and Woroch	1995	software	1) Copyright should not extend to de facto standards; 2) software interfaces should not be copyrighted, because of market power extension; 3) allow reverse engineering for interoperability
Kasdan	1994	software	Lack of computer science personnel among PTO examiners means prior art search incomplete, e.g. Knuth's book ignored; software patents undesirable
Kingston	2001	general	Lower cost of patent disputes in complex technologies via 1) Compulsory expert arbitration with legal aid; 2) Shared-risk compulsory licensing
Levin and Levin	2002	general	Introducing a patent opposition process would give substantial welfare gains
Lemley	2001	general	Do not try to improve patent quality by increasing exam time, because PTO is "rationally ignorant," given cost of higher quality patents
Quillen	2001	general	1) Raise standards for patentability; 2) Reduce resulting uncertainty and delay in validity determination; 3) Reduce excessive damages in patent infringement litigation; 4) Return appellate jurisdiction to regional courts so alternative views can be heard on the same issue
Barton	2000 2001	general	1) Raise standards for patentability by using a real non-obviousness test; 2) Clarify research exemption; 3) Ease legal attack on invalid patents (strengthen re-exam, remove presumption of validity)
Janis	1997	general	Recommends an inter partes re-exam system modeled on trademark re-exam and similar to European opposition system

*Complete citations are given in the Reference section

Figure 1
US Patent Classes with Software/Business Method Patents Granted 1966-2002

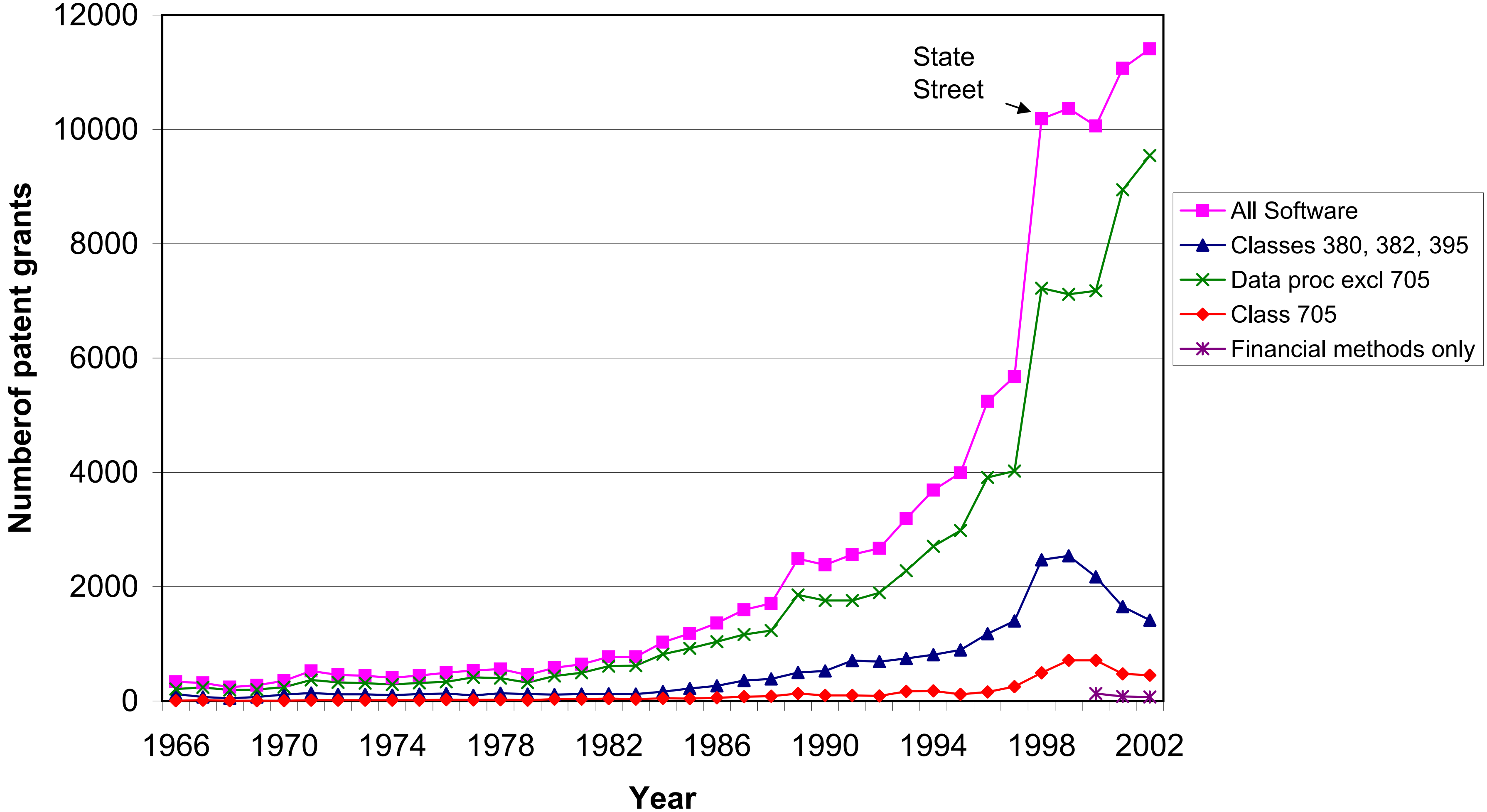

TABLE A1
Class 705 Patenters with 10 or more patents

Firm name	1963-1980	1981-1990	1991-2000	Total
Pitney Bowes	29	140	158	327
IBM	13	27	169	209
Reliance Electric	10			10
Tokyo Electric	9	14	3	26
Sharp	6	40	14	60
Casio	5	19	7	31
Omron Corp	5	36	5	46
Canon	1	2	9	12
H-P	1		18	19
EDS Corp	1		27	28
NCR	1	7	71	79
Hitachi	1	21	69	91
US Govt	1	2	7	10
NEC corp	1		9	10
Alcatel		12	9	21
Toshiba		8	15	23
AT&T/Lucent		7	59	66
Merrill Lynch		6	16	22
Unisys		4	9	13
Visa Intl Service		4	18	22
Schlumberger		3	7	10
Mitsubishi		3	18	21
Francotyp-Postalia AG & Co		3	26	29
Fujitsu		3	90	93
Catalina Marketing		2	17	19
Citibank		2	47	49
Oki Electric Industry		1	9	10
GE		1	13	14
Sony		1	12	13
Matsushita Electrical		1	32	33
Walker digital/Priceline			65	65
Microsoft			33	33
Neopost			28	28
Xerox			20	20
Intel			16	16
Sun micro			16	16
Veri-fone			16	16
e-Stamp corporation			15	15
i2 technologies inc			15	15
Northern Telecom			14	14
Health hero network			13	13
Andersen consulting			12	12
Siemens			12	12
Motorola			11	11
Nippon T&T			10	10
Other Firms	124	259	1737	2120
Unassigned	73	111	658	842
Total	**281**	**739**	**3654**	**4674**