Computer Software Patents: Some Perspectives and Misunderstandings

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The importance that in-house software plays today in many organizations is without question. Perspectives of efficiencies, effectiveness, competitive advantage, and so on are but three areas where such applications exist. Many organizations have adopted measures to protect such software as a specific type of intellectual property. In the 1990s quite often the form of protection taken is software patents. The understanding and enthusiasm about software patents that is exhibited by organizations is not often shared by information systems researchers, however. For the most part, IS researchers dismiss software patents as an appropriate protective measure. This paper presents some background on patents and their applicability to software. Some US and international perspectives are also discussed to provide the reader with a somewhat broader perspective. We then discuss several IS research endeavors that either dismiss patents, or treat them incorrectly. We conclude with a research agenda for IS researchers.

Introduction

There is little question that information systems (IS) play a very important role in most organizations today. Discussions about this, with supporting evidence, have recently been presented by Brancheau, Janz, and Wetherbe (1996), who identified key issues in IS management for the latter 1990s. Some of those points are: building a responsive IS infrastructure,

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developing and implementing an information architecture, improving the effectiveness of software development, making effective use of the data resource, managing the existing portfolio of legacy applications, and facilitating and managing end-user computing. With regard to specific types of IS, in this paper computer software, what is not widely discussed by IS researchers are the steps or actions that an organization can and should take to protect its investment in that software that is considered crucial in terms of how well it competes and how ultimately successful it might be. The nature of the protection referred to in this situation is that which can be taken to prevent rivals or competitors from trying to copy the technology and obtain benefits with little investment on their own.

It is acknowledged that some IS are more important than others. What is not always evident, fully comprehended, or even dealt with correctly, however, is the necessity of protecting investments in computer software, especially that software that is developed in-house for use by the firm.[1] Examples of such applications include systems for: product evaluation, electronic cataloging, automated billing, and financial systems such as portfolio analysis and account management. Such application software can make important contributions to how successfully a firm is able to compete. For example, if an organization is able to reduce its cost structure significantly in relation to its competitors, or is able to provide a product or service that its competition either cannot provide or cannot provide as well, then the firm would have an advantage over its competition. Moreover, if the firm was able to achieve this advantage as a result of application software that it developed, or had developed for it, it stands to reason that the firm should take appropriate measures to protect it.

As a form of intellectual property, computer software is protectable through a number of mechanisms. These include copyrights, trade secrets, and patents. For the most part, each of these forms of protection has its advantages, disadvantages, and characteristics, and the decision as to which form(s) of protection should or could be used will depend on the nature of the software as well as numerous perspectives of the organization, including its goals and objectives, competitive and environmental situation, the nature of its industry, and the ever more important global perspective, to name just four. In addition, there are a number of costs associated with each of these forms of protection, such as actual financial costs and time to obtain protection for the technology in question. The method of protection addressed in this paper is patents—one of the most important measures available today to protect a valuable software asset, as well as one of the most misunderstood by the academic community.

The enthusiasm—and even the nature and understanding—of software patents is something that has been accepted, even embraced, by industry. However, the subject matter is one that has not been investigated thoroughly by IS researchers, and when it has been mentioned in research, erroneous conclusions based on incomplete or incorrect interpretation have often resulted. Such conclusions can lead to incorrect inferences affecting further research. What little IS research dealing with patents that has been

conducted tends to dismiss this form of protection. In effect, this body is unaware of the value that patents can provide to organizations.

The nature of software patents, as well as the number of them, attests to the interest and value that organizations place on them. In this regard, organizations may consider their competitive position within the industry in which they operate and the value they place on business processes/activities that are supported by software. Several types of systems were listed above for illustrative purposes. If organizations are not actually or potentially threatened by competitors, they might find little usefulness in protecting software investments. However, most organizations find it necessary to compete vigorously today, often for their very survival. Likewise, if organizations find little value in their existing portfolio of software applications, or determine that little of value is probable regarding future software development efforts, then they might find little incentive in considering patents as a protective measure. Methodologies such as the Strategic Grid (Cash, et al., 1992) provide guidelines for determining the current and future impact of IS within a competitive environment. However, as evidenced by Brancheau, Janz, and Wetherbe's (1996) findings, it would appear that most organizations today pay heed to their software assets. If it can be assumed that many, if not most organizations, would find themselves hurt competitively if at least some of their applications were lost, stolen, or no longer available to them, it stands to reason that appropriate protective measures, such as patents, should be investigated thoroughly. In fact, this approach to protection is a valuable tool today for many organizations.

There is another important viewpoint that needs consideration—that dealing with the global or international situation relative to patents on software. Patents provide significant protection to new ideas and processes, thereby providing individuals, companies, and even governments with a strong incentive to protect these inventions early. It is also strongly suggested that an active patenting and enforcement system is embodied by countries competing at the leading edge of technology in many fields (Roy, Tuch, and Clark, 1997). Unfortunately, even as many organizations find themselves vigorously competing globally, international patent perspectives remain at best uncertain to many.

This paper addresses the nature of protection of application software as intellectual property, specifically dealing with patents. It provides background information on just what patents are and how they apply to computer software. Important developments in the US legal community that have helped to make this form of protection viable are also addressed. Since the global arena regarding the treatment of intellectual property, as well as the general nature of international competitive aspects, have changed, quite dramatically during the decade of the 1990s, we devote some discussion to patent perspectives as affected by the General Agreement on Tariffs and Trade (GATT) and the Trade Related Intellectual Property Rights (TRIPs) agreement. Support for how and why IS researchers should thoroughly investigate patents as a form of protection for software are addressed. IS

research that has investigated patents, however superficially or incorrectly, is also discussed. The paper concludes with a discussion and research agenda for IS researchers.

Background Information on Patents

This section provides a review of some of perspectives of the US patent system. It should be especially helpful to those who may be less familiar with intellectual property in general, and with patents in particular. It is recognized that some readers may be interested in a more in depth treatment of the subject, a treatment that is not possible due to time and space constraints. Readers interested in a more in depth treatment should consider Kastriner (1991), The Advisory (1992), Abramson (1995), and Miller and Davis (1990). Following this introductory review, we examine software patents in greater detail as pertains to the US, followed by a discussion of some international issues.

Patent protection is provided for in the US constitution, dating to 1790, with the current law codified in Title 35 of the United States Code (USC). The United States Patent and Trademark Office (USPTO) administers the application process and granting of patents. Patents are granted for useful, novel, and nonobvious inventions, which must fall into one of four categories: machine, article of manufacture, process, or composition of matter (Szepesi, 1996). Patent laws are intended to promote the progress of science and industry by providing financial incentives to inventors or their assignees by granting them exclusive rights for a number of years.[2] These rights include the right of an inventor to exclude others from making, selling, or even using the invention. In essence, patents grant their owners a monopoly for a number of years. In return for this protection, the inventor is required to disclose a written description of the invention and the method of making and/or using it in sufficient detail so that those who are skilled in the relevant art/science are able to practice the invention (Mendenhall, 1988). The rationale for requiring a disclosure of an invention to gain patent protection is that it is considered to be to society's benefit to promote the disclosure and availability to the public of innovative devices or methods so that the benefits derived from the invention are not lost when the term of the patent expires (Siller and Retsky, 1993).

Until the mid 1970s, patents had lost much of their appeal as a way of protecting innovations. Kastriner (1991) feels that this was due to a pervasive antitrust, anti-monopoly sentiment which was incorporated into US public policy and was expressed in the attitudes and practices of all three branches of the government for over seventy years. Kastriner (1991) posits that "the 1970s saw an end to that era, as the American public began to understand some of the causes of this country's economic problems and started on a new course intent on regaining our once formidable lead in technological innovation and creativity which has always been the lifehood of this nation" (pp. 6–7). During the 1980s, actions were taken by the government to strengthen and revitalize the patent system. This revitalization

has come with legislation—much of it intended to curb infringement—and, more significantly, with the creation of the Court of Appeals for the Federal Circuit (CAFC) in 1982 which has been granted exclusive jurisdiction over patent appeals (Gholz, 1984; Kastriner, 1991; Bender and Barkume, 1992; Merz and Pace, 1994).

The primary motivation for the creation of the CAFC was to stabilize patent law because of inconsistent interpretations and results in the 12 Circuit Courts of Appeal. Gholz (1984) acknowledged these inconsistencies, observing that in 1970 a patent attorney's advice to a client was that if potentially infringing activity was carried out, it should be done within the jurisdiction of the Eighth Circuit Court of Appeals since that Circuit had not held a patent either valid or infringed within recent history. Gholz states that this was reasonably good advice at that time and that the client's major error was probably not following that advice since the infringing activity was conducted within the jurisdiction of the Tenth Circuit Court of Appeals, which had recently found the patent to be valid and infringed on. Merz and Pace (1994) assert that these inconsistencies also led to forum shopping by both patentees and potential infringers alike.

The impact the CAFC has had on patent prosecution through enforcement was studied by Merz and Pace (1994). Using data for the period from July 1971 through December 1991, they hypothesized that since the CAFC has increased enforceability, has patent litigation also increased? Their results indicated that a significant increasing trend in litigation occurred some time after April, 1982. Further, they theorize that the increase in enforceability and, thus, the value of patents may explain the dynamic increase in patent filings in the past ten years.

Patents and Their Relationship to Computer Software

United States Perspectives

Bender and Barkume (1992) report that, in 1980, when the proprietors of the first spreadsheet program inquired about the possibility of obtaining a patent, they were told that it could not be done. This may have been a fair reading of patent law at that time. If it had been known at that time that substantial changes in patent law were in the offing, the advice to them may have been different.

Then, as early as 1981, Flewellen (1981) asserted that since there was a constantly expanding need by businesses for software that exceeded the pace at which programs were being developed, there was a need for a mechanism, such as a patent, to encourage the invention of such software by providing legal protection of the software developer's investment. Yet, there had been considerable controversy regarding whether software was even patentable.

That changed, however, in 1981 when the US Supreme Court held that software could be patented (Diamond, 1981). This case and the creation of the CAFC in 1982 has led to an increase in the number of patent filings and

the number of patents issued for computer software (Bender and Barkume, 1992). The US Supreme Court's decision to provide for the patentability of software in the *Diamond* v. *Diehr* (1981) case is significant. The Court declared that a claim for an invention using a computer for one or more steps of a process was valid subject matter for patent protection. Specifically, the Court stated that a claim drawn to subject matter otherwise statutory [a manufacturing process, in this case] does not become nonstatutory simply because it uses a mathematical formula, computer program, or digital computer (Diamond, 1981).

The Court declared that a claim for an invention using a computer for one or more steps of a process was valid subject matter for patent protection. The result of this decision has led to a proliferation of software-related inventions. In 1982, the first reported case involving the validity of a patent on software was brought before the District Court in Delaware. In this case, Paine Webber (1983) challenged the validity of the patent obtained by Merrill Lynch on its Cash Management Account (CMA). Paine Webber argued that the CMA was a business method and that business methods and systems cannot be patented. Paine Webber asserted that the method claimed by Merrill Lynch simply described a series of steps that could be carried out by hand with the aid of paper, pencil and telephone. The Court held that the claims recited were patentable subject matter because they taught a method of operating a computer. This case may have been instrumental in motivating organizations to invest in the development of in-house business-related IS, since the investment could now be protected from competitors if it is patented.

The perception that IS application software cannot be patented may be based on seven elements that Bender and Barkume (1992) label as so-called Conventional Wisdom (p. 280) that they state are out of step with reality and, if considered, could lead a would-be IS inventor astray. The seven elements are: (1) Software inventions will not be issued patents because they are inappropriate subject matter for patent protection; (2) The requirements set forth in patent law are so stringent that most computer programs would be precluded from consideration; (3) Even if a software patent is issued, the time involved in the patent process would be so lengthy that the software patent would be useless because the commercial life of the software would have passed; (4) Even if a software patent is issued, it would have little value because the courts exhibit hostility towards patents and are averse to enforcing them; (5) It is too costly to obtain a patent; (6) Courts will not issue preliminary injunctive relief to patent holders when infringement occurs; (7) Since a patent is a public document, the program source code must be disclosed and anyone, including competitors, can get a copy of it from the Patent Office for only $3.00. Bender and Barkume (1992, p. 280) state that "on the spectrum of reliability, each of these bits of 'Conventional Wisdom' falls somewhere between misleading and flat wrong."

A committee of the State Bar of Michigan published a survey in 1988 (Survey, 1988) that concluded that the patentability of software was firmly established and that the Patent Office was issuing a large number of patents for a

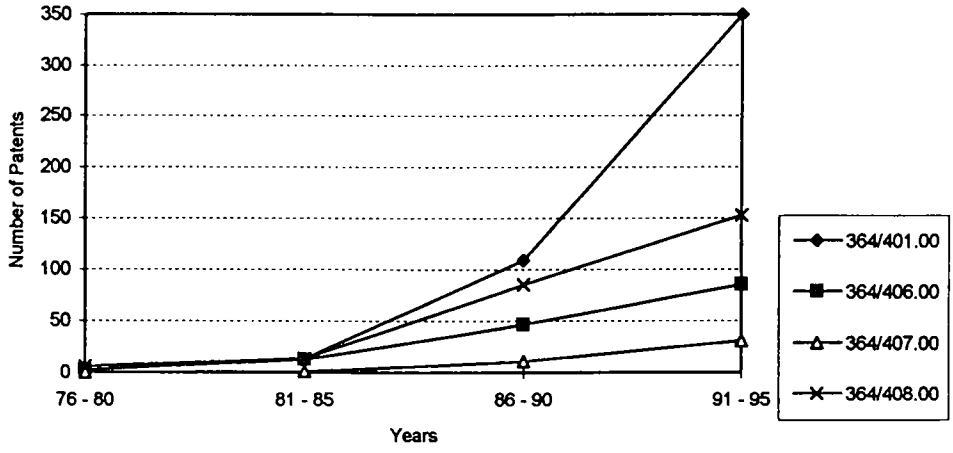
wide variety of IS applications. The survey also noted that the use of patents to protect IS applications was becoming more attractive to software developers due to the powerful form of legal protection patents provide and due, particularly, to the changing judicial attitudes toward patents in general. While it is true that some software is not appropriate for patent protection, numerous valuable aspects of many programs or of their use are and, currently, software patents are being granted in such areas as computer-controlled processes, human/computer interfaces, computer-implemented algorithms, *and business methods implemented on computers* (Bender and Barkume, 1992).

The importance that organizations place on their application software is, in most instances, without question. Often, these types of IS are designed to support key business processes that can provide exceptional value to these firms. For example, a firm's competitive position within its industry can be greatly enhanced by how well it interacts with its customers and suppliers; in turn, the nature of that interaction may be based on key business processes that are supported by IS. Several patented IS are discussed below to provide substance to this perspective. They are all issued under Patent Class 364, Electrical Computers and Data Processing Systems. Additional information regarding US patents may also be found on the World Wide Web at URL http://www.uspto.gov, the web site for the U.S. Patent and Trademark Office.

One of the more well-known organizations, Mrs. Fields, Inc. of Park City, Utah (Mrs. Fields, 1992), makers of Mrs. Fields' cookies, was assigned a patent in 1992 for a system for making staff schedules as a function of available resources. The patented system also dealt with employee skill level, availability, and priority, at unique remote locations away from a central site. The system and method includes a data base storing, among other data items: central office policy, applicable labor requirements, tasks that need to be performed, skill levels required to perform tasks, resources that may confine or facilitate the scheduling of a task at a given time, relationships between tasks, and employee information such as skill level and start-time and stop-time. When the system receives a request to create a schedule, it selects all the tasks to be performed on that day, and using historical data about that specific location, the tasks, the skill required to complete the tasks, the available resources, employee availability, and central office policy, creates an optimized display of the required schedule. The patent contains twelve claims, and it is listed under the subclass for Business Practice and Management.

United Healthcare Corporation of Minneapolis, Minnesota (United Healthcare, 1994) was assigned a patent in 1994 for a health care payment adjudication and review system. The computer-based expert system reviews and adjudicates medical health care payment requests made by physicians to payers, such as insurers, for procedures performed and services and materials rendered to patients in the course of treatment. The system adjudicates a payment request to minimize fraud and mistakes and to determine whether to honor the request and if the request is honored, the dollar amount of the payment. The expert system reviews the payment request

FIGURE 1
Software Patents for Selected Sub-Classes of Patent Class 364



Source: United States Patent Office Database; http://www.uspto.gov

based on user-specified review criteria, which reflects contractual arrangements between payers, providers, and patients, current locally acceptable medical practices, and patient and provider payment request patterns. The patent contained 10 claims, and it is listed under the subclass for Business Practice and Management.

Plains Cotton Cooperative Association of Lubbock, Texas (Plains Cotton, 1991) was assigned a patent in 1991 under the finance subclass (e.g., securities and commodities) for a commodity trading system. Each commodity, such as a bale of cotton, is represented in the data base with all information unique to each commodity, including a title flag. The title flag field indicates whether the title to the cotton bale is carried by way of a card-type warehouse receipt, or electronically. The electronic representation of title eliminates the transferal of documentary type title which is traditionally mailed to various locations to follow the trading transactions. The patent contains thirty-eight claims.

The examples listed above are but three of many thousands of software patents that have been issued during the past fifteen years. For example, Figure 1 displays software patents for four business oriented subclasses for Patent Class 364. It shows clearly that software patents pertaining to business applications have continued to increase dramatically. Furthermore, Mr. Raymond D. Norton, Managing Attorney in Intellectual Property Protection & Contracting Services, The SABRE Group, emphasized the importance of protecting an IS investment through patenting of software. He stated that if a company develops an IS application but does not patent it, and a competitor copies it or develops a similar IS application and subsequently patents it, the organization that developed the application originally must either stop using it or pay for licensing it (1996).

International Perspectives

The world today has indeed become much smaller, thanks in part to advancing communications- and information-based technologies. Organizations throughout the world which formerly were constrained geographically now find it necessary to be aware of global opportunities and to be able to take advantage of them should it be deemed important to achieve competitive advantage, or even just to survive. At the same time, it must be recognized that the U.S. is an integral part of this global perspective. For example, the U.S., with 4.6 percent of the world's population and 21.3 percent of the Gross National Product, has installed about 59 percent of the global computing power (Strassmann, 1997). Related to this U.S. position are studies that have shown that the information sector in OECD (Organization for Economic Cooperation and Development) countries, mostly Western nations and Japan, is at least 25 percent of the economy whereas, for example, in India it is only 14 percent (Kelkar, Chaturvedi, and Dar, 1991).

It should therefore come as no surprise that issues surrounding the protection of information-enabling technologies (e.g., computer software) must be well understood and dealt with correctly if organizations throughout the world are to compete successfully today. This perspective is supported by a 1992 report to the U.S. Secretary of Commerce (The Advisory, 1992) that indicated that both Japan and the European Community have targeted the software industry as being critical to their global industrial competitiveness and that they show strong support for the patentability of computer software. Their interest is evidenced by the rapid increase in patent applications filings in this area of technology in both Japan and the European Community. Further, these increased filings throughout the world suggest that business organizations regard patents as necessary to protect research and development investment, that is, "patent protection allows the innovator, who has higher costs due to research and development, to compete with the imitator or copyist who has lower costs due to little or no research and development success" (The Advisory, 1992:156).

The Report also states that, internationally, there has been an increased awareness of how important it is to protect intellectual property, especially as pertains to the development of domestic industries, in stimulating foreign investment, and in enhancing free and fair trade. Gopinath and Ravishankar (1996) share this viewpoint, indicating that intellectual property rights, which include patent protection, have become important elements for discussion among nations as they may have considerable bearing on the wealth of nations in the future. Patent protection is seen as being so important that when a nation does not provide it, businesses have relocated to countries that do. For example, the uncertainty regarding biotechnology's patent protection in Europe resulted in a number of those types of firms relocating to the U.S. to benefit from protection under U.S. law (The Advisory, 1992). From this example, the Report stated that any perceived weakening of computer-related patent protection in the U.S., com-

pared to other countries, could result in a technology drain from the U.S., as occurred internationally in the biotechnology industry.

It is not possible in this paper to delve deeply into all of the different perspectives related to patent protection for computer software as dealt with throughout the world; neither time nor space would permit it. However, some aspects are generic enough in nature to make them important for discussion from our perspective. One concerns the General Agreement on Tariffs and Trade (GATT) and the Trade Related Intellectual Property Rights (TRIPs) agreement. In Europe, software patenting is certainly more important now, especially with organizations attempting to work out the consequences of GATT and TRIPs as compared with the provisions found in the European Patent Convention and specific national laws. Provisions of GATT/TRIPs relating to patents lack the exclusions from patentability for software and business methods that are found in the European Patent Convention. Patents are to be available for all inventions, in all fields of technology, provided only that they are new, inventive, and useful. The omission of computer programs as excluded matter is not because the provisions are insufficiently detailed—they expressly permit exclusions for reasons of "*ordre publique*" or morality and of methods of medical or veterinary treatment or plants and animals. It would appear that, to comply with GATT and TRIPs, the European Patent Convention and national laws in Europe may have to change in this respect, paralleling more closely those in the U.S. when it comes to software patenting (Cook, 1994).

In summary, it would appear that the matter of protection of intellectual property, in general as well as issues specific to software, require diligence on the part of most organizations. This is especially true if firms compete or intend to do so internationally. Just as software technology seems to incur dramatic changes quite frequently, perhaps a more intensive examination of the patent process itself, especially that dealing with software, is needed. Thurow (1997) and Shulman (1995) suggest this. From an IS research perspective, what assertions have been made, and what directions might IS research take? Some of these issues are addressed next.

Issues for IS Researchers

The impact of the events in the U.S. described above—the *Diamond* v. *Diehr* ruling, the strengthening of patent law, the creation of the CAFC, the Paine Webber case, and the strong growth in the number of software patents granted—as well as the dynamic nature of the protection of software assets internationally, would suggest that this is a research area that should be thoroughly investigated by the IS community. Unfortunately, as was pointed out at the beginning of this paper, IS researchers have either ignored patents as a form of protection for a firm's vital software assets, or they have reached erroneous conclusions about such measures, often due to dated research. Indeed, careful review of some research could certainly draw into question some of the theories and dated research that have been utilized by IS researchers to support their conclusions. The changes in patent

law have been so profound that Kastriner (1991) states that if a patent attorney, like Rip Van Winkle, awoke in 1990 after a ten-year slumber, his/her knowledge of patent law would be completely outdated to the point that the answers he/she would give to even the most simple questions about patent law would be wrong. Such an analogy has implications for IS researchers as well. This section of this paper addresses several of the misnomers and research problems that can affect dramatically current and future IS research efforts and, ultimately, organizations themselves.

The misunderstanding of patent protection and the role it is currently playing in organizations has led to research conclusions that may be irrelevant. There is little doubt that organizations have sought to protect IS that involves significant investment in time and money. Szepesi (1996) notes that trade secret was the protection of choice in the 1970s, copyright in the 1980s, and patents in the 1990s and that all three are being used to protect IS today. That patent protection is currently a strong protective mechanism for software is supported by the number of patents that have been issued. Figure 1 graphically illustrates the rise in patents since the *Diamond* v. *Diehr* decision and the creation of the CAFC.

The changes in patent law, be they in the U.S. or internationally, if not recognized by IS researchers, can lead to erroneous or misleading conclusions. For example, empirical research by Mansfield, Schwartz, and Wagner (1981), Mansfield (1985), and Lieberman and Montgomery (1988) was used by Mata, Fuerst, and Barney (1995) to support their positions. The research by Mansfield et al. (1981) presented data gathered before 1982 with respect to the effects of patents on imitation costs and on the rate of innovation. Their study showed that patents do not necessarily result in a seventeen-year monopoly over an innovation and further, that while patents do tend to increase imitation costs, patent protection did not appear to be essential for the development and introduction of at least three-fourths of the patented innovations that were studied. They found that about 60 percent of the patented innovations in their sample were imitated within four years. Mansfield (1985) presented data, also gathered before 1982, regarding the speed at which various kinds of technological information leak out to competitors. The results showed that, on average, competitors were able to obtain information concerning development decisions within about twelve to eighteen months and that information concerning the detailed nature and operation of a new process or product usually leaks out within a year.

Both of these studies—Mansfield et al. (1981) and Mansfield (1985)—based their results on data samples collected before 1982 and, given the study by Merz and Pace (1994), may currently have little relevance, particularly for research involving IS. Recall the *Diamond* v. *Diehr* decision and the creation of the CAFC. Even though these studies are dated, they have continued to be relied upon by researchers. The following are two examples where these studies have been used to support research conclusions.

Mata et al. (1995) not only cite Mansfield (1985) and Mansfield, et al. (1981), but also Lieberman and Montgomery (1988). The research by Mata,

et al. (1995) examined IS technology and the sustainability of competitive advantage. Citing Mansfield (1985) and Mansfield et al. (1981), they state that although proprietary technology has been suggested as a source of sustained competitive advantage, even if IS technology could be patented, there is evidence that patents provide little protection against imitation. Further, citing Lieberman and Montgomery (1988), they state that factors, such as; workforce mobility, reverse engineering, and formal and informal technical communication can act to reduce the secrecy encompassing proprietary technology. They then conclude that proprietary technology would not be a source of sustained competitive advantage.

Lieberman and Montgomery (1988) surveyed the theoretical and empirical literature on mechanisms that bestow advantages and disadvantages on first-mover organizations. They found that two basic mechanisms considered in the literature that can provide first-movers with an advantage were: (1) learning or experience curve advantages where costs fall with cumulative output; and (2) success in patent or R&D races where product or process technology advances are a function of R&D expenditures. Citing Mansfield, et al. (1981), they effectively eliminate patents as an advantage to first movers, stating that patent races are important to only a few industries, like pharmaceuticals, and that in most industries patents provide only weak protection and are easy to invent around. They then found that one of the disadvantages of being a first mover was that late movers may be able to "free ride" on first-mover investments and that imitation costs are lower than innovation costs in most industries. The idea that imitation may be financially advantageous to competitors is no longer a reasonable assumption. In 1983, Merrill Lynch won a $1 million settlement from Dean Witter after charging that Dean Witter had infringed its CMA patent (Merrill, 1983).

First-mover advantages/disadvantages have been cited often in IS literature. Three examples where first-mover factors are used are contained in works by Clemons and Row (1991), Feeny and Ives (1990), and Clemons (1986). They have all relied on material, such as that found in Lieberman and Montgomery (1988), to support their positions.

1. Clemons and Row (1991) recognized that significant first-mover effects can result in sustainable competitive advantage if the innovator can preempt the market and defend that position successfully. Nevertheless, they exclude first-mover effects from their study because they believed that it cannot be defended effectively enough to gain competitive advantage. In supporting their reason for excluding first-mover advantages, they state that it is difficult for first movers to keep their ideas secret, to keep improving an idea faster than their competitors, and to get a product adopted rapidly enough to preempt the market.

2. Feeny and Ives (1990) dealt extensively with first-mover advantages/disadvantages. Citing Vitale, (1986), they note that strategic IS applications may provide limited advantages before they are copied by competitors. Consequently, they propose a three pillared framework as a means to assess the sustainability of IS-based competitive advantage. Three questions

suggested by the three pillars were then examined. They were: "1. How long before a competitor can respond to our idea? 2. Which competitors will respond? 3. Will a response be effective?" (p. 30). After discussing these questions at length, they state in their conclusions that first movers should perform a sustainability analysis to determine whether an IS application can be defended against the competition. Their opinion is that if it cannot be defended, management should forego the excitement and cost of being a first mover and "settle for a fast, cheap, and effective follower role" (p. 44).

3. Clemons (1986) studied IS and sustained competitive advantage. He provides general conditions that appear to be necessary for the development of sustained competitive advantage. He characterizes IS as being either internally or externally focused applications. Internal IS applications are generally those used within a firm for cost reductions or quality improvements while external IS applications are used primarily by customers, clients, or suppliers, and should add value.

Clemons (1986) proposes that when externally focused innovations result in substantial switching costs to a customer, their benefits may result in sustained competitive advantage, regardless of competitors' response. In this situation, he feels that the innovator will enjoy positive first-mover effects. He claims that internally focused IS applications do not offer the possibility of customer switching costs and so must provide benefits to the firm and be consistent with the firm's strategy. With respect to first-mover effects, he states that since an IS application cannot be protected from copying by competitors, it will become a commodity service. He feels that this would be a strong argument against absorbing the cost of early introduction—being a first mover.

In each of these three examples, there is the lingering perception that first movers are disadvantaged because followers are able to copy an innovation generally at a lower cost and less risk. This may be the case if the IS is not patented. If a patent is involved, though, the lower cost and risk of copying by a follower brings increased risk of a finding of infringement and, consequently, significantly higher costs. Indeed, because of the protection a patent now offers, being a first-mover could prove to be necessary to not only thwart competitors from copying and, subsequently, using innovative IS, but to ensure its unhampered use by the innovating firm.

Research Agenda

The apparent increase in software patents certainly indicates actions by organizations that have not been appropriately recognized by IS researchers. A number of research items reviewed above attest to this. It is important, therefore, that a more concerted research effort be undertaken to examine the full impact and effect of software patents on firms and their success.

How are firms using patents? It should be determined if firms are just seeking protection for their software assets. It is also important to know

whether firms are being provided with additional revenue as a result of their patents. In this instance, revenue can be derived through licensing of the patented IS application to others.

A number of theories could be used to investigate firm and individual behavior toward software patents. For example, Ajzen's (1991) Theory of Planned Behavior is a well-researched theory that has been used empirically in a broad variety of situations to predict and understand behavior. It deals with a person's attitude, subjective norm, and perceived control over the behavior in question—the use of software patents in this instance. Appropriately designed instrumentation can be used to better understand how patents are perceived by senior executives and mid-level managers with better and more grounded research aimed at predicting behavior on a broader scale.

How are firms assessing their proprietary IS position? Abramson (1995) suggests that potential investors in emerging technology firms should conduct a patent search to determine whether patents exist that could expose the firm to damaging litigation expenses and possible injunctions. Similar questions should be directed to all firms, not just those high technology firms.

The nature of competitive advantage has been addressed during the past several years. However, its relationship to software patents has not been investigated. For example, Porter's forces and strategies approach to identifying competitive advantage might have applicability regarding competitive advantage. Use of patents to protect business-oriented IS applications might provide a firm with the ability to differentiate itself from its competition or to allow it to become the low cost producer. Too, sustaining a competitive advantage is a related, but perhaps more important, question. Research models that have dealt with this construct [e.g., Mata et al. (1995)] can be examined to ascertain whether software patents affect the validity of such models.

Some firms may choose to innovate and seek patent protection immediately, whereas others may decide to license software from a patent holder. This is similar to what occurred in the case of Merrill Lynch's patented CMA system and Merrill's relationship with Dean Witter. A model to determine the specifics of this course of action would be helpful. Related to this is an examination of firms who in fact do license their patented software to others. What benefits do they perceive in doing so?

In the end, it is important that IS researchers recognize that a responsibility exists to arrive at a better understanding of this form of protection for software assets. It simply is not acceptable at this point in time to ignore the matter, as has occurred in most research.

Notes

1. Our research is focused on IS applications that are either developed by an organization or for an organization, such as by a consultant, for use by the firm in its business. It is not intended to deal with off-the-shelf software that is being developed for resale.
2. Patents that have an effective filing date before June 8, 1995, or that were in force on

that date, are protected for seventeen years from the date of issue, or twenty years from the date of first filing. After that date, patents are protected for twenty years from the date of application. The patent is only enforceable after it issues, however.

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