

Association for Information Systems AIS Electronic Library (AISeL)

ICIS 2006 Proceedings

International Conference on Information Systems
(ICIS)

December 2006

Business Method Patents: Do Owners Gain/ Sustain Competitive Advantage?

Nancy Martin

Southern Illinois University at Carbondale

Peter Mykytyn, Jr.

Southern Illinois University at Carbondale

Follow this and additional works at: <http://aisel.aisnet.org/icis2006>

Recommended Citation

Martin, Nancy and Mykytyn, Jr., Peter, "Business Method Patents: Do Owners Gain/Sustain Competitive Advantage?" (2006). *ICIS 2006 Proceedings*. 112.

<http://aisel.aisnet.org/icis2006/112>

This material is brought to you by the International Conference on Information Systems (ICIS) at AIS Electronic Library (AISeL). It has been accepted for inclusion in ICIS 2006 Proceedings by an authorized administrator of AIS Electronic Library (AISeL). For more information, please contact elibrary@aisnet.org.

BUSINESS METHOD PATENTS: DO OWNERS GAIN/SUSTAIN COMPETITIVE ADVANTAGE?

Valuing IT Opportunities

Nancy L. Martin

College of Business and Administration
Southern Illinois University at Carbondale
nlmartin@siu.edu

Peter P. Mykytyn, Jr.

College of Business and Administration
Southern Illinois University at Carbondale
mykytyn@cba.siu.edu

Abstract

The importance of information systems (IS) and information technology (IT) as strategic business tools has been widely acknowledged by both practitioners and academics. Hence, researchers have long been interested in the business value of IT and its influence on gaining and sustaining competitive advantage. Many claim that IT is subject to easy duplication and lack of protection and therefore sustained competitive advantage from IT is not a reality. However, other researchers have been able to show that the strategic use of IT applications can lead to longer term superior performance. Business method patents could be the missing link between the strategic use of IT and sustained competitive advantage. These patents have become much more valuable and enforceable in recent years providing protection for the patent owner that has not been considered by academicians. In this study, 40 patenting firms were matched with 40 nonpatenting competitors and their performance was compared in order to explore patent-protected IT-enabled sustained competitive advantage. The ownership of business method patents was not found to be a significant contributor to competitive advantage. However, patent-owning firms that were able to gain an initial performance improvement were more likely to maintain that advantage over time.

Keywords: Competitive advantage, business method patent, IS strategy

Introduction

The importance of information systems (IS) and information technology (IT)¹ as strategic business tools has been widely acknowledged by both academicians and practitioners. In fact, IT has become ubiquitous in today's business environment to the point that IS applications are viewed as strategic necessities (Barua et al. 1997; Clemons 1986). Hence, researchers have long been interested in the business value of IT and its influence on gaining and sustaining competitive advantage.

A firm is said to have a competitive advantage when it is able to achieve returns above industry averages. Since the early 1980s, the use of strategic information systems (SIS) to obtain competitive advantage has been a popular topic in IS research. Many conceptual frameworks of IT as a competitive advantage have been offered (Bakos et al. 1986; Mata et al. 1995; McFarlan 1984; Porter et al. 1985). Most of this theoretical work suggests that IT can contribute to

¹An IS has been defined as a physical process for collecting, processing, storing and analyzing data, and disseminating information to achieve organizational goals. IT can be defined as either the technology component of an IS or as the entire collection of systems in an organization (Turban et al. 2004). For the purposes of this research, IS and IT are used interchangeably.

competitive advantage by creating easier access to markets, increasing product differentiation, improving cost efficiencies or changing the nature of an industry.

The IS competitive advantage research stream moved beyond conceptual development through the attempts of numerous scholars to empirically link IT to firm performance and competitive advantage. Many studies focused on a single strategy and considered one measure of performance over a one year period (see Mahmood et al. 1993 for a summary). While studies over a brief period may offer important insights into the IS-competitive advantage link, they only truly reflect a snapshot in time. A few studies of note have considered multiple measures over multiple years (Bharadwaj 2000; Brown et al. 1995; Dehning et al. 2003; Kettinger et al. 1994; Santhanam et al. 2003) and have shown that competitive advantage and sustained competitive advantage are attainable with IT. However, more multi-year, multi-measure research is needed in order to offer a broader picture of any contribution made to a firm's performance by an innovative use of IT. Moreover, the issue of protection of that advantage has yet to be thoroughly and empirically examined (Piccoli et al. 2005). Software-based business method patents may be a source of protection warranting further study.

In discussions of attaining and sustaining competitive advantage with IT, most researchers have concluded that patents are not a useful means to protect IT, usually stating that patents do not provide protection or that patents are difficult to obtain (Bettis et al. 1995; Clemons et al. 1991; Kettinger et al. 1994; Mata et al. 1995). Of those studies specifically related to IT, none is known to have empirically supported their viewpoint.

Mykytyn and Mykytyn (2002) brought this issue to light in their study of patent-related citations in the IS literature. They reviewed IS literature over the prior twelve year period and traced the vast majority of patent-related IS citations to one source. Of particular concern was that the cited study was unrelated to software- and IT-based patents; yet the reference has been used repeatedly in the IS literature to support the position that patents do not protect software- or other IT-based innovations from imitation.

Another important issue in the discussion of the value of software-based business method patents is the initial and subsequent support of software patent protection within the U.S. legal system. Federal court decisions since 1980 have broadened and strengthened the economic value of software patents. The increase in these types of patents led the United States Patent and Trademark Office (USPTO) to create a new class 705 specifically for business methods. Furthermore, it is widely believed that a 1998 federal court decision in the case of *State Street Bank & Trust Co. v. Signature Financial Group, Inc.* was instrumental in highlighting the broadened scope of software patents which included software-based business methods (Lesavich 2001). Signature obtained a patent in 1993 on a software program that was used to determine the value of mutual funds. State Street Bank sued to have the patent invalidated on the grounds that it covered a business method and was hence not patentable. In the final appeal, the court explicitly rejected State Street's claim and Signature's patent was upheld. The decision specifically stated that software with the purpose of governing business methods can be patented as long as it produces some concrete, useful, tangible result (Ovans 2000). Several authors provide summaries of the events that occurred in the court system related to software patents throughout the past two decades (Graham et al. 2003; Mykytyn et al. 2002). The lack of treatment of patents in IS research combined with the changing legal landscape of software patents fuels the need to further explore the software patent phenomenon.

Research Questions

Headway is being made in the search for empirical links between IS and competitive and sustained competitive advantage. Studies have identified various factors that contribute to the success and sustainability of IS (Brown et al. 1995; Kettinger et al. 1994; King et al. 1996). However, in none of these studies has the issue of protection of the competitive advantage been addressed. Business method patents could be a discriminating factor that has not yet been considered. Moreover, there has been a specific call for research to explore the potential influence of software patents in sustaining competitive advantage (Mykytyn et al. 2002). Hence, there appears to be a gap in the literature that the current study will attempt to fill. Following are the specific research questions addressed.

1. *Do firms that patent IS innovations achieve a competitive advantage compared to firms that do not?*
2. *If so, is that advantage sustained over time?*

The empirical studies briefly discussed thus far have each made important contributions to the growing knowledge base related to the impact of IT on competitive advantage and firm performance. However, extensions of that work are needed to “convert tentative belief to accepted knowledge” (Berthon et al. 2002, p. 416). This paper describes a study that was designed to address important gaps in the literature related to the use of patents to protect IT-enabled competitive advantage while extending the work of other IS scholars.

Theoretical Foundation

A seminal article in IS competitive advantage literature forms the basis for the current study. Kettinger et al.(1994) explored the strategic use of IS with the specific purpose of identifying sustainability. Their study focused on 30 firms which were well known for their strategic use of IS. The authors analyzed changes in performance measures over a 10 year period following the SIS implementation and showed that half of the firms were able to sustain their competitive advantage for 10 years after the SIS implementation.

The Kettinger et al. (1994) study identified groups of “sustainers” and “nonsustainers”, and then considered what factors might differentiate between the two groups. From an extensive literature search, the authors developed three sets of potential factors that were believed to influence the ability of competitors to effectively respond to a SIS launch. Although the theoretical model contained 16 factors in three categories, the study focused on six industry and organizational factors in particular. The six factors considered were industry structure, firm size, organizational base, learning curve, technological resources and risk management. All were assessed using widely available accounting measures.

Kettinger and his colleagues (1994) found that these six factors, related to the firm’s environment, organizational base and actions or strategies, delineated fundamental differences between firms that were able to sustain a competitive advantage from a SIS and firms that made use of a SIS but were not able to sustain a competitive advantage. Specifically they found that sustainability seems more likely to occur in industries with few major competitors and for firms with the availability of capital for investment in technological resources. Sustainers were also identified as being more risk taking, lower cost producers and overall larger in size than nonsustainers. Kettinger et al.’s (1994) study was important because it provided an early attempt to conceptually and empirically examine factors contributing to the sustainability of an IS-enabled competitive advantage.

The current study builds upon the work of Kettinger and his colleagues by introducing a construct for patent ownership to the theory of IS-enabled competitive advantage. Business method patents have been argued by some to help protect the competitive advantage established by an IS. A patent is designed to confer legal protection of an innovation to the patent owner for a period of 20 years. With today’s rapid pace of technological change, it is not likely that an IS-enabled competitive advantage will last for 20 years. However, patent protection may invoke some period of protection from imitation that would not have otherwise been afforded. For this reason, it is important to consider the role of business method patents in the relationship between IS and sustained competitive advantage.

Due to space limitations, only one phase of the current study is reported herein. This paper focuses on the identification of sustainers and nonsustainers and the comparison of their performance.

Methodology

The objective of the current study was to discern whether the patenting of software-based IS impacts the owner firm’s ability to achieve and sustain a competitive advantage and to build upon the model of sustainability first introduced by Kettinger and his colleagues (1994). The research design adopted for this study employs a matched sample comparison group methodology which incorporates a time series analysis using historical data. The unit of analysis is the firm.

Sample Selection

To conduct this study, a group of IS-patenting firms and their matched sample non-patenting competitors was required. The final sample consisted of 80 firms, 40 patenting firms and their 40 matched sample competitors. The following sections describe the multi-step sample refinement process and data collection procedures.

Step 1: Identify Potential Sample Firms

The first step in the data collection process was to identify sources from which to compile a list of strategic IS that would comprise the sample population. In the Kettinger et al. study (1994), an initial list of strategic IS cases was compiled from published materials including scholarly journals, IS textbooks and trade publications. For the current study, we began with the list of firms compiled by Kettinger and his colleagues. The most current reference cited in the Kettinger et al. list was from 1992. Thus, a literature search of academic and trade journals from 1992 forward was conducted to identify strategic IS that have gained popularity since the initial study. These journals included, but were not limited to, *Information Systems Research*, *Management Science*, *MIS Quarterly*, *Journal of Management Information Systems*, *Journal of the Association of Information Systems*, *Journal of Strategic Information Systems*, *Communications of the ACM*, *Harvard Business Review*, *Sloan Management Review*, *CIO*, *Information Week*, and *InfoWorld*. Additionally, the USPTO Web site² contains a number of statistical reports and one such report identifies organizations and their respective number of issued patents in class 705 through the end of 2004. Organizations identified from that report were added to the firms in our initial pool resulting in a population of 175 firms.

Step 2: Determine IS-Related Patent Ownership

Once the initial population of firms was identified, the sample had to be reduced to those firms that had patented an IS-based business method. In the next step of sample refinement, the USPTO database was searched to identify business method patents owned by the firms of interest. At this point, it is important to clarify what type of patented IS and which patenting firms were the focus of the current study.

We were interested in patents covering software-based business methods which could include patents that were either fully or partially embedded in hardware. Software-based business method patents cover a variety of business applications and most are likely found in class 705; however they may appear in other classes as well. Examples of such patents include Amazon.com's one-click ordering system patent, Priceline.com's reverse pricing patent, Dell's build-to-order production process patent, and the classic Signature Financial Group's mutual fund valuation patent. The key similarity in these examples is that they all represent a business method or model that is implemented through a unique use of IS. It is this type of patented strategic IS application that was the focus of the current study.

To be included in this study, the focal firm must have patented all or a portion of the IS of interest. That is, if Firm A was chosen for the sample based on the strategic use of IS and identified as a patenting firm but their patents were issued on technology or innovations unrelated to the IS, then the firm was removed from the sample. In order to verify that the IS of interest was in fact the patented innovation, examination of the patent record and/or other publicly available documents was necessary. Patent documents available through the USPTO and other sources such as law journals and trade press were reviewed for information that aided in the assurance that our sample IS was indeed the patented IS.

To further clarify the focus of this research, it is important to identify types of firms that were included in the study. We were not interested in firms that own the IS but that do not own the patent for the IS. For example, IBM develops many systems for its customers; however IBM generally retains patent rights. In this situation, both the IS owner firm and IBM would be excluded from the sample. We also were not interested in firms whose primary market is software production, such as Microsoft or Computer Associates. To summarize, we were interested in firms that have been granted a patent on an IS innovation that was developed for their own use. Through this initial review of the USPTO database and the subsequent removal of firms the sample was reduced to 67 patenting firms.

Step 3: Verify Availability of Performance Data for Patenting Firms

Firm performance data was collected from the COMPUTSTAT financial data set. Standard & Poor's COMPUTSTAT data set provides the annual and quarterly Income Statement, Balance Sheet, Statement of Cash Flows, and supplemental data items on most publicly held companies in North America. All of the data necessary to calculate the measures used in this study are available in the COMPUSTAT data set. Therefore, only firms which appear in the COMPUSTAT data set were retained in the sample. This restriction further reduced the sample size.

² <http://www.uspto.gov>

The initial review of the 67 potential patenting firms revealed that only 47 of the firms were contained in the COMPUSTAT database. Of those 47 firms, only 40 firms had complete data for all the years required for our study. A list of the 40 patenting firms along with the business method patent of interest is included as Appendix A.

Step 4: Identify Matched Sample Competitors

Once the final sample of patenting firms was selected, their relative industries were identified based on the Global Industry Classification Standard (GICS) code. The GICS performs better than other industrial classification codes in explaining stock returns, valuation ratios and financial performance ratios (Bhojraj et al. 2003). Each GICS code consists of eight digits. The left-most two digits identify a firm's economic sector; the next two digits refer to the industry group; the third two digit group identifies the industry, and the final two digits categorize a firm's sub-industry. The entire eight digit code provides the most specific categorization for a firm within its competitor group. For this study, the eight digit GICS was collected in order to identify the most specific group of industry competitors.

Next, the nearest competitor for each patenting firm was identified. Within the COMPUSTAT data set, firms are grouped by GICS code. Within a firm's eight digit GICS code, the nearest competitor was identified as the firm with the five-year average sales level closest to the focal firm, a procedure that has been followed by other IS researchers (Bharadwaj 2000). Finally, the USPTO database was checked to insure that the identified competitor does not own a business method patent. Competitors that own patents on other technology unrelated to IS, such as a patent on a tool or chemical process, were retained in the study. However, if the competitor was found to own a business method patent, that firm was removed from the matched sample and the next nearest competitor was substituted. This final step of data collection resulted in a matched sample of 40 patenting firms, their 40 nearest non-patenting competitors, and their relative industries. A list identifying each firm, competitor and industry is included as Appendix B.

Performance Measurement

Kettinger and his colleagues (1994) developed relative profitability and marketshare measures which were used to classify their sample firms as sustainers and nonsustainers. These measures consider the focal firm and its matched sample competitor relative to the industry. Kettinger et al.'s measures provide a means to compare both the focal firm and the matched sample competitor to the industry and to each other, relative to the industry, at the same time. The current study will utilize those same performance measures to divide the entire group of 80 firms into sustainers and nonsustainers.

Relative Profitability

Relative profitability is defined as a firm's profitability relative to its industry. Kettinger et al. (1994) chose this measure because it helps to control for confounding variability due to general economic conditions, the growth stage of an industry, and any legal or regulatory considerations. In the current study, the stock market crash of 2000 and the changing nature of the patenting landscape are important factors that this measure can help control for in firm performance.

Return on Sales (ROS) was used to calculate the relative profitability measure. Relative profitability was calculated by taking the average ROS of the firm and dividing it by its respective industry average ROS for a given time period. This measure is produced by averaging the ROS over each period of the study. For example, if a firm's average ROS in a particular period was eight percent while the industry average ROS was six percent, then the firm's relative profitability for that time period was 1.33. In this manner, each firm can be compared to the industry rather than solely to another firm. This is yet another control for confounding effects.

Relative Marketshare

Relative marketshare is defined as a firm's marketshare compared to its largest competitor. Kettinger et al. (1994) chose this measure since marketshare has long been supported as a key dimension of firm performance and since many of the classic cases of strategic IT were intended to improve marketshare (Clemons 1986).

Relative marketshare was calculated as the “ratio of (patenting) firm marketshare to its largest competitor’s marketshare” (Kettinger et al. 1994, p. 43). The largest competitor is that firm with the greatest marketshare in the same industry as the patenting firm. For example, if the patenting firm’s marketshare in a given time period was 15% while the marketshare of their largest competitor was 25%, then the patenting firm’s relative marketshare would be .60.

Timeframes for Measurement

In the Kettinger et al. (1994) study, performance was measured over three stages. Stage 1 covered the five year period prior to system launch. Stage 2 included the period from system launch to five years post launch. Kettinger and his colleagues argued that the movement in performance from Stage 1 to Stage 2 was representative of the initial performance impact of the IS. Stage 3 covered five years post-system launch to 10 years post-system launch. Positive movement in either profitability or marketshare from Stage 1 to Stage 3 was considered indicative of a sustained competitive advantage.

In the current study, the performance of the patenting firms and their competitors was also analyzed over three separate time periods. The first period included the five years immediately prior to the firm’s patent application and is called the pre-application period. The second time period included the time from the patent application until the award of the patent. This interim period is referred to as the midyear period. Improvement in relative marketshare and/or relative profitability from five years prior to the patent application up to the award of the patent was considered to represent an initial competitive advantage.

The third period included the three years immediately following the patent award. In the current study, the sample was limited as to availability of data 10 years after the patent award due to the fact that business method patenting is a relatively recent phenomenon. For this reason, the post-award period began with the year of the patent award through three years afterward. Further improvement or maintenance of the firm’s positions in either marketshare or profitability in this time period was considered to be indicative of a sustained competitive advantage.

Hence, a sustainer is defined as a firm that showed improvement in either relative marketshare and/or relative profitability from pre-application to mid-year and from pre-application to post-award. Firms that showed no initial advantage from pre-application to the midyear period did not qualify as sustainers and were deemed to be nonsustainers. Firms that did show an initial improvement in either relative marketshare or relative profitability, but were not able to continue that improvement through the post-award period were also deemed nonsustainers.

Identification of Sustainers and Nonsustainers

In Kettinger et al.’s (1994) study, improvement in either relative marketshare or relative profitability from IS pre-launch to five years post-launch was considered representative of a positive initial performance impact. Improvement from pre-launch to ten years post-launch represented a sustained competitive advantage. In the current study, we deemed an initial competitive advantage to be represented by positive movement in either relative profitability or relative marketshare from pre-application to the mid-year period. If improvement continued in either measure through the post-award period, the advantage was considered to be a sustained one.

By tracing the movement for both the patenting firms and their nonpatenting competitors, we identified the sustainers and nonsustainers. The firms are shown in Table 1, following Kettinger et al.’s (1994) example. To conserve space, the firm names have been replaced with their ticker symbol as annotated in Appendix B. The shaded boxes in Table 1 represent sustainers. These firms experienced growth in relative profitability (RPROF), relative marketshare (RMKT), or both, from the pre-application period to the post-award period. The firms listed in bold are the patenting firms; the non-bold firms are the competitors. Two competitors are listed twice and four are listed followed by (2). These are competitors that are partnered with more than one patenting firm. The two firms that are listed twice, COGN and TRB, performed differently over the time periods relative to their specific partner firm. The four competitors listed with a (2) include CNA, FISV, MXIM and R. These four firms had the same performance movements for the time periods for each of their two partner firms. The (2) indicates that these firms should be counted twice to contribute to the total firm count of 80 firms that were analyzed. Several examples follow to aid in interpreting Table 1.

**Table 1. Change in Competitive Position from Pre-application to Post-award
Adapted from Kettinger et al. (1994)**

		Movement from Pre-Application to Post-Award							
		Profitability Down Marketshare Down		Profitability Down Marketshare Up		Profitability Up Marketshare Down	Profitability Up Marketshare Up		
Movement from Pre-Application to Midyears	Profitability Up Marketshare Up	CNA (2) IR		AMAT AVX HLTH MXIM (2) PXR			FDC FDX FISV(2) HBAN KRB LMLP	MGM ORBK TRB TTN WATFZ	
	Profitability Up Marketshare Down	COGN KEY R (2)				ALL COGN ESCC HET HHS	MENT RCI SCG TER VCI	EFX	
	Profitability Down Marketshare Up	ADSK AMSY AVA CPWR		CKP COF EMAK MAPS MDT PGR	POS PSFT RTRSY SBL SNV	3NEOM AGYS		ACS AM BAC BBT BSX	CELL ETN ITRI MAT UPS
	Profitability Down Marketshare Down	DIS FSTW MGIC MHP	NOVL RTN TA2 TRB	GD		3AFFI ABN ATML LSI MGEN SYMC		BC VIA.B	

Example 1 –ADSK (Autodesk, Inc.)

A firm’s movement in marketshare and profitability from Stage 1 to Stage 2 is identified by reading down the first column of cell headings in the table. For example, ADSK showed lower profitability and higher marketshare from pre-application to the midyear period. A firm’s movement from Stage 1 to Stage 3 is tracked across the columns. For ADSK, from pre-application to post-award, marketshare was down and profitability was down. Therefore, ADSK did enjoy an initial performance impact but was unable to sustain that impact beyond the midyear period. Therefore, ADSK was classified as a nonsustainer.

Example 2 – 3AFFI (Affinity Technology Group, Inc.)

Reading down the first column of headings, 3AFFI’s marketshare and profitability were both down from pre-application to the midyears. Reading across the header row, 3AFFI’s marketshare was down but its profitability was up from pre-application to post-award. Therefore, 3AFFI did not gain any initial competitive advantage. Even though the firm’s profitability was higher over the longer term, the initial drop in profitability from pre-application to the midyear period prevented 3AFFI from being labeled a sustainer.

Example 3 – FDC (First Data Corporation)

Again reading down the first column of headings, FDC experienced higher marketshare and higher profitability from pre-application to the midyear period representing an initial competitive advantage. Reading across the table,

FDC also enjoyed higher marketshare and higher profitability from pre-application to post-award representing a sustained competitive advantage. Thus, FDC was deemed a sustainer.

Example 4 – CKP (Checkpoint Systems, Inc.)

Due to its visual position in Table 1, it might not seem logical that CKP would be considered a sustainer. Reading top to bottom, CKP rose in marketshare but fell in profitability from pre-application to the midyear period. However, a gain in only one category, either marketshare or profitability, was considered the attainment of an initial competitive advantage. Then reading across the table, even though CKP experienced further losses in profitability, its marketshare continued to grow from pre-application to post-award. This continued growth in marketshare from pre-application to the midyear period and on through post-award represented an initial and sustained competitive advantage. CKP was considered a sustainer.

Results

Research Question 1

Our first research question pondered whether IS patenting firms gained an initial competitive advantage over their non-patenting competitors. To address this question, we began by analyzing Table 1. By segregating the rows from columns in Table 1, we can identify the number of firms that did enjoy some initial competitive advantage. Recall that reading down the rows reveals movement of relative profitability and relative marketshare from pre-application to the midyears which include the year of the patent application up to the year of award. The bottom row lists firms that did not show improvement in either measure during this period. These 17 firms gained no initial competitive advantage. However, 63 firms did benefit from a performance improvement from pre-application through the midyears. Of those 63 firms, 32 were patenting firms, 31 were nonpatenting firms. A Chi-square test was performed to determine if there was a potential relationship between a firm owning a business method patent and the firm achieving some initial competitive advantage. The Chi-square test was nonsignificant ($p = .785$) indicating that the likelihood of a firm gaining an initial competitive advantage was not related to ownership of a patent.

Research Question 2

The primary thrust of the statistical analysis addresses our second research question which asked if patenting firms sustain a competitive advantage. Fifty firms were categorized as sustainers, 30 as nonsustainers. Of the 50 sustainers, 27, or 54%, are patenting firms. Of the 30 nonsustainers, 13, or 43.3%, are patenting firms. To specifically address Research Question 2, a Chi-square test of differences was performed. The test was nonsignificant at $p = 0.356$, indicating that there was no significant difference between patenting firms and their nonpatenting competitors being classified as sustainers versus nonsustainers.

Statistical Comparison of Relative Performance Measures

To further test for statistical differences between the two groups, patenting and nonpatenting firms, nonparametric independent samples t-tests were performed. Nonparametric tests were utilized because the data did not display normal distribution. Specifically, The Mann-Whitney test was used for testing differences between means since there were two conditions and different subjects comprised each condition (Field 2000). The Mann-Whitney test works by evaluating differences in the ranked positions of scores in different groups.

In this analysis, we were interested in comparing the relative measures of profitability and marketshare for patenting firms and their competitors over the three time periods. If the patent conferred an advantage measurable in relative profitability or relative marketshare, we would expect that the tests would display significant differences in the midyears and/or post-award periods. The results of the nonparametric independent samples t-test are shown in Table 2. Only relative profitability (RPROF) in the pre-application period was significant.

Table 2. Results of Nonparametric t-tests

Time Period		RPROF	RMKT
Pre-application	Mann-Whitney U	542.000	706.000
	Exact Sig. (2-tailed)	0.013*	0.369
Midyears	Mann-Whitney U	700.500	668.000
	Exact Sig. (2-tailed)	0.341	0.206
Post-award	Mann-Whitney U	694.000	726.000
	Exact Sig. (2-tailed)	0.311	0.480

*Significant at the .05 level.

Table 3 displays the mean ranks data from the Mann-Whitney tests. Scores are ranked from lowest to highest; therefore, the group with the lowest mean rank is the group with the greatest number of lower scores in it. Similarly, the group that has the highest mean rank should have a greater number of high scores within it. Therefore, the data in Table 3 can be used to determine which group had the highest relative profitability and relative marketshare. For example, in the pre-application period for relative profitability, patenting firms had a mean rank of 46.95 and the nonpatenting firms had a mean rank of 34.05. This means that the patenting firms had a greater number of high scores in relative profitability. The test of significance from Table 2 indicates that patenting firms had significantly more high scores than nonpatenting firms in this time period.

We can also use the mean ranks data to track the movement from one period to the next. For instance, we see in Table 3 that the relative profitability of the patenting firms fell from pre-application (46.95) to the midyear period (38.01), but rose from the midyears to the post-award period (43.15).

Table 3. Mean Ranks from Mann-Whitney Tests

Time Period		GROUP	N	Mean Rank	Sum of Ranks
Pre-application	RPROF	PATFIRM	40	46.95	1878.00
		NOPAT	40	34.05	1362.00
		Total	80		
	RMKT	PATFIRM	40	42.85	1714.00
		NOPAT	40	38.15	1526.00
		Total	80		
Midyears	RPROF	PATFIRM	40	38.01	1520.50
		NOPAT	40	42.99	1719.50
		Total	80		
	RMKT	PATFIRM	40	43.80	1752.00
		NOPAT	40	37.20	1488.00
		Total	80		
Post-award	RPROF	PATFIRM	40	43.15	1726.00
		NOPAT	40	37.85	1514.00
		Total	80		
	RMKT	PATFIRM	40	42.35	1694.00
		NOPAT	40	38.65	1546.00
		Total	80		

Discussion

In this study we were interested whether patenting firms would outperform their nearest nonpatenting competitors in measures of relative profitability and relative marketshare. We compared the relative profitability and relative marketshare of the patenting firms and their nonpatenting competitors over the five year period prior to the patent application, the midyear period from patent application to award, and the three year post-award period.

Relative Profitability

Recall that relative profitability is the ratio of the firm's ROS to the subindustry's ROS for a given period. ROS is a ratio of net income to assets. In evaluating the mean ranks data from the nonparametric t-tests for relative profitability, the patenting firms performed better, relative to their subindustries, than their nonpatenting competitors in the pre-application period and in the post-award period. Only the pre-application period differences were significant. During the midyear period, the nonpatenting competitors performed better. This might be explained by the patenting firms amassing the necessary infrastructure or other assets necessary to implement the patented innovation during the midyear period. An increase in assets would lower the ROS ratio. Although the performance differences were not significant in the post-award period, the patenting firms' relative profitability did improve. In the post-award period, the patenting firms were again higher than their competitors in relative profitability, just not significantly so. Although it cannot be stated as a certainty, it is plausible that the improvement in the post-award period was due to the advantages provided by the patented innovation.

It is interesting to note also that the competitors' trend from pre-application to post-award was opposite that of the patenting firms. The relative profitability of the competitors rose from pre-application to the midyears, but then dropped from midyears to post-award. Because these are relative measures, it is possible that the upward movement by the patenting firms forced the competitors' relative profitability in the downward trend. More in depth analysis of the movement in firm assets might shed more light on this situation.

Relative Marketshare

Relative marketshare was the ratio of the patenting and competitor firms' marketshares to that of the largest competitor in the subindustry. The relative marketshare of the patenting firms was higher than that of their competitors in all three periods, but not significantly so. The relative marketshares for both groups stayed relatively stable throughout the entire pre-application to post-award period. This result suggests that the patented innovations did not enhance the owner firms' positions in marketshare. It is possible that the owners of the largest marketshare possessed such an extreme advantage that improvements that were the result of the patented innovations were not detectable in our measures. Our three period measures were calculated as the average relative marketshare over the multiple year periods. Closer scrutiny of the year by year marketshare changes between the three groups will be required to better understand this result.

Since we did see improvement in relative profitability over the analysis period, it might also be conceivable that our sample of patents did not include a proportionate share of innovations that were intended to address marketshare as a competitive advantage. Perhaps more in depth case studies of firms such as Dell and Amazon.com, which were not included in our sample, could improve our understanding of the impact of business method patents on relative marketshare.

Sustainers and Nonsustainers

In addressing our first research question, we revealed that 17 firms gained no initial competitive advantage, so they could not be considered as sustainers even if their performance improved from midyears to post-award. However, this means that 63 firms did benefit from a performance improvement from pre-application through the midyears. Of those 63 firms, 32 were patenting firms. Of the 32, 27, or 84.4%, were able to maintain that improvement through the post-award period. Moreover, of the original 63 firms to report an initial performance impact, 31 were nonpatenting firms. Of the 31 nonpatenting firms, only 22, or 71%, were able to maintain their initial performance improvement. Although the results of the tested difference was nonsignificant, there was clearly a greater number of

patenting firms able to sustain the initial performance impacts they gained in movement from pre-application through the midyears.

To address our second research question, all 80 firms, 40 patenting and 40 nonpatenting, were categorized based on their performance movements from pre-application through post-award periods. Recall from Table 1 that the firms listed in the shaded boxes were considered to be sustainers. That is, each firm showed improvement in RPROF, RMKT or both from pre-application to post-award timeframes. Although the patenting firms comprised a greater percentage of the sustainers, (54% of sustainers, 43.3% of nonsustainers), the difference was not significant.

One concern in this analysis was that the post-award period was only three years after the patent was issued. Only 40 patenting firms were identified that had data available for the pre-application, midyears, and subsequent year periods. After three years post-award, the sample size fell from 40 to 13 in year four, 17 in year five, and so on. Therefore, the three year post-award period was selected for analysis. However, to better understand the performance movements of the firms, the changes in RPROF and RMKT were tracked as far out as data was available. That is, for firms that had more than three years of data available, the RPROF and RMKT values were calculated and the changes from pre-application period to each of the available later periods was traced to see if the classification of sustainer versus nonsustainer would be affected.

As a result of this extended analysis, eight firms' classifications would have changed. Of the patenting firms, only one firm, HBAN, would have been classified as a nonsustainer rather than a sustainer, but only in year 10 following the patent award. In year 11, HBAN would again have been classified as a sustainer. Of the nonpatenting competitors, seven firms' status would have changed. One firm, counted twice, CNA, would have moved from a nonsustainer to a sustainer in year six. One other firm, COGN, would have moved in the same direction in year five. Four competitors would have moved from sustainer to nonsustainer status: ESCC in year four, TER in year five, and COGN and WAFTZ in year seven. This result indicates that regardless of the year chosen, it appears that more nonpatenting competitors lost RPROF or RMKT impacts than did the patenting firms. However, given the small number of firms with data available in later years, further analysis is warranted. Since the business method patent phenomenon is relatively new, this analysis should proceed as more years of data become available.

Implications for Research

Although IS-enabled competitive advantage has been a topic of interest to academicians and practitioners for decades, only in more recent years have empirical studies begun to emerge which directly address the possible sources of such advantages. Furthermore, how a competitive advantage may be protected has yet to be empirically studied at all. To address these lapses in IS competitive advantage research, the current study introduced business method patents as a potential source of competitive advantage. As a result, the study makes several contributions to current theory in IS competitive advantage.

First, this study introduces the business method patent as a possible source of competitive advantage. In that respect, this study has served as a building block for the expansion of IS competitive advantage theory. For example, Mata et al. (1995) discussed sustained competitive advantage using the resource-based view of the firm as a theoretical underpinning but dismissed treatment of technology as proprietary in general and patents in particular as a means to sustain competitive advantage. The findings presented here suggest that researchers may want to reinvestigate the role of patents, especially business method patents, from a resource-based perspective.

Second, the study provides an early step toward building a construct representative of protection of competitive advantage. In our study, we evaluate the business method patent as the potential source of protection. In our analysis, we were able to show that more often patenting firms maintained an advantage once it was established. If a patent does not serve as a source of an initial competitive advantage, it may still play a key role in protecting that advantage.

Third, the introduction of business method patents in IS research helps to keep IS academia more current with practice. Business method patents have been gaining popularity since the late 1990s, yet IS research is limited with regard to the investigation of this concept. For example, Mykytyn and Mykytyn (2005) examined the extent to which patents and other types of intellectual property were integrated into undergraduate MIS degree programs in an attempt to see how well students are prepared to enter the MIS workplace; they found that students were generally ill

prepared to deal with business-related issues such as patents and other forms of intellectual property. Hopefully, the current study will stimulate other researchers to continue empirical efforts in this area in an effort to better understand the role that business method patents play in today's organizations.

Implications for Practice

This study is the first known attempt to incorporate business method patents into empirical studies of competitive and sustained competitive advantage. IS academic literature has yet to address the patent issue even though it has been of particular interest to practitioners for years. This study will alert practicing managers that IS academia is attentive to the changing nature of the patent landscape and that we are committed to providing relevant research.

The statistical results of this study may further kindle the debate over the value of business method patents. The number of business method patent applications has grown exponentially in the past decade, yet the results we have shown suggest that these patents do not provide an advantage that is quantifiable in our selected measures. Consequently, before firms rush to patent an innovation, it may be worthwhile to perform a cost benefit analysis on the patenting process. Filing a patent application means that the details of the invention become public knowledge. It could be that competitors are using that knowledge to counter the innovation through means that do not infringe upon the patent as filed. Hence, firms must weigh the cost of "going public" versus relying on trade secrets.

On the other hand, managers and other practitioners may realize that there are other reasons to secure protection of software through patent protection besides the financial-based measures investigated in this research. Other reasons may include obtaining licensing revenue, developing a defensive portfolio, making it more difficult for the competition to initiate certain measures, and even legitimizing technology to clients and/or investors (Meyer, 1992). Firms might also attempt to integrate Meyer's (1992) reasons with our findings.

Limitations and Future Research

This study is not without limitations. The primary concern in this study is generalizability. The sample was purposefully selected and the final sample size consisted of 40 firms matched with 40 competitors. The purposeful sample combined with the small sample size prevents us from making broad generalizations from our results. Future research should strive for a larger, more randomized sample.

Second, the sample selection was limited by the availability of COMPUSTAT data. This restriction meant that we could only include publicly traded firms in the sample. Many of the business method patents identified at the USPTO were not owned by publicly traded firms. This limitation also bounds the generalizability of this study. Future studies should strive to include all types of firms, not just those that are publicly traded.

Third, since business method patenting is a relatively recent phenomenon, the post-award period of analysis was limited by the availability of data. The firms in this study should be tracked for several more years in order to better understand the potential financial benefits of patenting business methods.

A final limitation is the nature of firm performance studies. Financial performance is impacted by countless factors. Therefore, isolating the impact of a business method patent from other confounding factors is extremely difficult. We attempted to ameliorate this concern by including variables that were shown in previous research to impact the sustainability of performance impacts. Future studies should include a greater variety of measures in an attempt to capture the potential competitive advantage effects.

Additionally, qualitative studies are a must. We plan to conduct field and case studies in an effort to identify the nonfinancial rewards that firms believe they will reap as a result of business method patenting. Our research will also explore firms' decisions to patent versus not patent their IS innovations.

In addition to the research directions discussed above that are directly related to the current research, other avenues of research should be investigated, particularly since the international arena dealing with software-based patents may be changing. For example, the European Union's perspectives on software patents have differed from those in the U.S. For the most part, software is not patentable in the European Union, but forces have been at work to change that position. Researchers should investigate international views that differ from those in the U.S. and relate them to

international firms' approach to pursuing sustained competitive advantage. Another direction related to the current research is the investigation of firms that have developed a portfolio of software-based patents versus firms that have a limited number of patents or no patents at all. As an example, Merrill Lynch has in excess of 20 software-based patents; Dean Witter has two. What are the reasons for this disparity? Are determinants as suggested by Meyer (1992) at work?

Conclusion

A patent is designed to confer legal protection of an innovation to the patent owner for a period of 20 years. Even with today's rapid pace of technological change, it is not likely that an IS-enabled competitive advantage will last for 20 years; however, firms are still racing to obtain business method patents for use as strategic business tools. For this reason, the topic should be of keen interest to IS academicians.

This study was important because it was a first attempt to introduce business method patents into the theory of IS-enabled competitive advantage. Many researchers, including most in IS, understand little about what, if anything, patents contribute to competitive advantage. Through our results we have gained valuable insights which will hopefully spawn further research into this important topic.

References

- Bakos, J.Y., and Treacy, M.E. "Information Technology and Corporate Strategy: A Research Perspective," *MIS Quarterly* (10:2), June 1986, pp. 107-119.
- Barua, A., and Lee, B. "An Economic Analysis of the Introduction of an Electronic Data Interchange System," *Information Systems Research* (8:4) 1997, pp. 398-422.
- Berthon, P., Pitt, L., Ewing, M., and Carr, C.L. "Potential Research Space in MIS: A Framework for Envisioning and Evaluating Research Replication, Extension, and Generation," *Information Systems Research* (13:4), May 2002, pp. 416-427.
- Bettis, R.A., and Hitt, M.A. "The New Competitive Landscape," *Strategic Management Journal* (16) 1995, pp 7-19.
- Bharadwaj, A. "A Resource-Based Perspective on Information Technology Capability and Firm Performance: An Empirical Investigation," *MIS Quarterly* (24:1) 2000, pp. 169-196.
- Bhojraj, S., Lee, C.M.C., and Oler, D.K. "What's My Line? A Comparison of Industry Classification Schemes for Capital Market Research," *Journal of Accounting Research* (41:5) 2003, pp. 745-774.
- Brown, R.M., Gatian, A.W., and Hicks Jr., J.O. "Strategic Information Systems and Financial Performance," *Journal of Management Information Systems* (11:4), Spring 1995, pp. 215-248.
- Clemons, E.K. "Information Systems for Sustainable Competitive Advantage," *Information & Management* (11:3) 1986, pp. 131-136.
- Clemons, E.K., and Row, M.C. "Sustaining IT Advantage: The Role of Structural Differences," *MIS Quarterly* (15:3) 1991, pp. 275-294.
- Dehning, B., and Stratopoulos, T. "Determinants of a Sustainable Competitive Advantage Due to an IT-Enabled Strategy," *Journal of Strategic Information Systems* (12:1), March 2003, pp. 7-28.
- Field, A. *Discovering Statistics Using SPSS for Windows* Sage Publications Inc., Thousand Oaks, CA, 2000.
- Graham, S.J.H., and Mowery, D.C. "Intellectual Property Protection in the U.S. Software Industry," in: *Patents in the Knowledge-Based Economy*, W.M. Cohen and S.A. Merrill (eds.), National Academies Press, Washington, D.C., 2003, pp. 219-258.
- Kettinger, W.J., Grover, V., Guha, S., and Segars, A.H. "Strategic Information Systems Revisited: A Study in Sustainability and Performance," *MIS Quarterly* (18:1), March 1994, pp. 31-58.
- King, W.R., and Teo, T.S.H. "Key Dimensions of Facilitators and Inhibitors for the Strategic Use of Information Technology," *Journal of Management Information Systems* (12:4), Spring 1996, pp. 35-53.
- Lesavich, S. "Are All Business Method Patents "One-Click" Away from Vulnerability?" *Intellectual Property & Technology Law Journal* (13:6), June 2001, pp. 1-5.
- Mahmood, M.A., and Mann, G.J. "Measuring the Organizational Impact of Information Technology Investment: An Exploratory Study," *Journal of Management Information Systems* (10:1), Summer 1993, pp. 97-122.
- Mata, F.J., Fuerst, W.L., and Barney, J.B. "Information Technology and Sustained Competitive Advantage: A Resource-Based Analysis," *MIS Quarterly* (19:4) 1995, pp. 487-505.

- McFarlan, F.W. "Information Technology Changes the Way You Compete," *Harvard Business Review* (62:3) 1984, pp. 98-103.
- Meyer, S. P., 1992. "Obtaining and Enforcing Patents for Software-Related Inventions: Avoiding the Pitfalls," *Software Law Journal* (5), pp. 715-738.
- Mykytyn Jr., P., and Mykytyn, K. "Computer Software Patents: A Dilemma in Competitive Advantage IT Research," *Communications of the Association for Information Systems* (8) 2002, pp. 109-130.
- Mykytyn, K., Mykytyn Jr., P.P., Bordoloi, B., McKinney, V., and Bandyopadhyay, K. "The Role of Software Patents in Sustaining IT-Enabled Competitive Advantage: A Call for Research," *Journal of Strategic Information Systems* (11) 2002, pp. 59-82.
- Mykytyn Jr., P., Mykytyn, K. and Harrison, D. "Integrating Intellectual Property Concepts into IS Training: An Empirical Assessment of Relevance-Rigor Disconnections," *Decision Sciences Journal of Innovative Education* (3:1), 2005, pp. 1-27.
- Ovans, A. "Can You Patent Your Business Model?," *Harvard Business Review* (78) 2000, p 16.
- Piccoli, G., and Ives, B. "Review: IT-Dependent Strategic Initiatives and Sustained Competitive Advantage: A Review and Synthesis of the Literature," *MIS Quarterly* (29:4) 2005, pp. 747-776.
- Porter, M.E., and Millar, V.E. "How Information Gives You Competitive Advantage," *Harvard Business Review* (63:4), Jul/Aug 1985, pp. 149-160.
- Santhanam, R., and Hartono, E. "Issues in Linking Information Technology Capability to Firm Performance," *MIS Quarterly* (27:1) 2003, pp. 125-153.
- State Street Bank & Trust Company V. Signature Financial Group, Inc., 149 f.2d 1368 (CAFC 1998).
- Turban, E., McLean, E.R., and Wetherbe, J. *Information Technology for Management: Transforming Organizations in the Digital Economy*, (4th ed.) Wiley, Hoboken, NJ, 2004.

Appendix A

Patent Data for Sample Firms

Ticker Symbol	Firm Name	Application Date	Issue Date	Patent Class [†]	Patent Number	Patent Title
ACS	AFFILIATED COMP SVCS	9/19/1997	3/14/2000	705/45	6,038,553	Self service method of and system for cashing checks
3AFFI	AFFINITY TECHNOLOGY GROUP INC	5/5/1999	8/15/2000	705/38	6,105,007	Automatic financial account processing system
ALL	ALLSTATE CORP	12/8/1995	9/15/1998	705/4	5,809,478	Method for accessing and evaluating information for processing an application for insurance
AM	AMERICAN GREETINGS	12/5/1994	8/27/1996	700/231; 705/27	5,550,746	Method and apparatus for storing and selectively retrieving product data by correlating customer selection criteria with optimum product designs based on embedded expert judgments
AMSY	AMERICAN MANAGEMENT SYSTEMS	12/21/1998	11/20/2001	705/7	6,321,206	Decision management system for creating strategies to control movement of clients across categories
AMAT	APPLIED MATERIALS INC	5/28/1996	11/2/1999	700/99;705/8	5,975,740	Apparatus, method and medium for enhancing the throughput of a wafer processing facility using a multi-slot cool down chamber and a priority transfer scheme
ATML	ATMEL CORP	11/26/1997	7/25/2000	713/202;705/41	6,094,724	Secure memory having anti-wire tapping
ADSK	AUTODESK INC	8/31/1992	2/15/1994	705/59	5,287,408	Apparatus and method for serializing and validating copies of computer software
AVA	AVISTA CORP	12/17/1997	7/27/1999	705/30	5,930,773	Computerized resource accounting methods and systems, computerized utility management methods and systems, multi-user utility management methods and systems, and energy-consumption-based tracking methods and systems
BAC	BANK OF AMERICA CORP	10/5/1998	10/3/2000	705/35	6,128,602	Open-architecture system for real-time consolidation of information from multiple financial systems
CELL	BRIGHTPOINT INC	6/6/1997	2/22/2000	705/28	6,029,143	Wireless communication product fulfillment system
COF	CAPITAL ONE FINANCIAL CORP	12/30/1998	2/8/2000	705/38	6,023,687	Method for creating and managing a lease agreement
POS	CATALINA MARKETING CORP	2/9/1995	3/18/1997	705/14	5,612,868	Method and apparatus for dispensing discount coupons
CKP	CHECKPOINT SYSTEMS INC	7/25/1997	2/15/2000	340/572.3;705/28	6,025,780	RFID tags which are virtually activated and/or deactivated and apparatus and methods of using same in an electronic security system
DIS	DISNEY (WALT) CO	8/10/1999	1/9/2001	700/91;705/5	6,173,209	Method and system for managing attraction admission
ETN	EATON CORP	5/19/1997	2/1/2000	705/412	6,021,401	Computer system, apparatus and method for calculating demand usage
EFX	EQUIFAX INC	5/20/1999	8/28/2001	726/7;705/38	6,282,658	System and method for authentication of network users with preprocessing
FDX	FEDEX CORP	10/24/1997	7/25/2000	705/28	6094642	Integrated data collection and transmission system and method of tracking package data
FDC	FIRST DATA CORP	10/16/1996	6/30/1998	705/35	5,774,879	Automated financial instrument processing system

Ticker Symbol	Firm Name	Application Date	Issue Date	Patent Class [†]	Patent Number	Patent Title
HET	HARRAHS ENTERTAINMENT INC	5/24/1996	6/2/1998	705/10	5,761,647	National customer recognition system and method
HBAN	HUNTINGTON BANCSHARES	8/7/1989	11/23/1993	705/45	5,265,007	Central check clearing system
ITRI	ITRON INC	12/9/1997	12/21/1999	705/412	6,006,212	Time-of-use and demand metering in conditions of power outage with a mobile node
KEY	KEYCORP	11/24/1997	9/12/2000	705/35	6,119,104	Composite banking desktop system
LSI	LSI LOGIC CORP	5/29/1997	10/17/2000	705/52	6,134,324	Method and system for distributing a plurality of software products, and limiting access thereto
MAPS	MAPINFO CORP	6/18/1998	8/8/2000	707/6;705/10	6,101,496	Ordered information geocoding method and apparatus
MAT	MATTEL INC	10/30/1998	3/27/2001	446/268;705/28	6,206,750	Personalized toys and methods for manufacturing and delivering the same
MHP	MCGRAW-HILL COMPANIES	2/18/1988	9/19/1989	707/9;705/35	4,868,866	Broadcast data distribution system
MDT	MEDTRONIC INC	1/27/1999	6/12/2001	600/300;705/3	6,245,013	Ambulatory recorder having synchronized communication between two processors
MENT	MENTOR GRAPHICS CORP	6/2/1995	12/7/1999	705/9	5,999,911	Method and system for managing workflow
MGEN	MICRO GENERAL CORP	5/2/1996	12/16/1997	705/408	5,699,257	Postage meter
3NEOM	NEOMEDIA TECHNOLOGIES INC	1/15/1999	3/16/2001	705/23	6,199,048	System and method for automatic access of a remote computer over a network
NOVL	NOVELL INC	4/4/1994	9/3/1996	705/59	5,553,139	Method and apparatus for electronic license distribution
PSFT	PEOPLESOFT INC	10/9/1997	4/10/2001	705/8	6,216,109	Iterative repair optimization with particular application to scheduling for integrated capacity and inventory planning
PGR	PROGRESSIVE CORP-OHIO	1/29/1996	8/18/1998	705/400	5,797,134	Motor vehicle monitoring system for determining a cost of insurance
RTN	RAYTHEON CO	4/9/1996	7/11/2000	705/8	6,088,678	Process simulation technique using benefit-trade matrices to estimate schedule, cost, and risk
RTRSY	REUTERS GROUP PLC	6/7/1995	7/13/1999	705/37	5,924,082	Negotiated matching system
SBL	SYMBOL TECHNOLOGIES	5/29/1998	8/8/2000	705/26	6,101,486	System and method for retrieving customer information at a transaction center
UPS	UNITED PARCEL SERVICE INC	2/5/1999	3/25/1999	705/28	6,539,360	Special handling processing in a package transportation system
VCI	VALASSIS COMMUNICATIONS INC	11/11/1998	5/8/2001	705/14	6,230,143	System and method for analyzing coupon redemption data
HLTH	WEBMD CORP	6/10/1999	9/11/2001	707/102	6,289,353	Intelligent query system for automatically indexing in a database and automatically categorizing users

[†]If the patent's primary class was not 705 or 707, then the primary class, along with the business method patent class, is listed.

Appendix B

Sample Firms, Competitors and Subindustries

Patenting Firm Company Name	Ticker Symbol	Nonpatenting Competitor Company Name	Ticker Symbol	GICS Sub-Industry	GICS Sub-Industry (Description)
AFFILIATED COMP SVCS	ACS	FISERV INC	FISV	45102020	Data Processing & Outsourced Services
AFFINITY TECHNOLOGY GRP INC	3AFFI	LML PAYMENT SYSTEMS INC	LMLP	45102020	Data Processing & Outsourced Services
ALLSTATE CORP	ALL	CNA FINANCIAL CORP	CNA	40301040	Property & Casualty Insurance
AMERICAN GREETINGS	AM	WATERFORD WEDGWOOD PLC	WATFZ	25201050	Housewares & Specialties
AMERICAN MANAGEMENT SYSTEMS	AMSY	TITAN CORP	TTN	45102010	IT Consulting & Other Services
APPLIED MATERIALS INC	AMAT	TERADYNE INC	TER	45301010	Semiconductor Equipment
ATMEL CORP	ATML	MAXIM INTEGRATED PRODUCTS	MXIM	45301020	Semiconductors
AUTODESK INC	ADSK	COGNOS INC	COGN	45103010	Application Software
AVISTA CORP	AVA	SCANA CORP	SCG	55103010	Multi-Utilities & Unregulated Power
BANK OF AMERICA CORP	BAC	ABN AMRO HOLDING NV	ABN	40101010	Diversified Banks
BRIGHTPOINT INC	CELL	AGILYSYS INC	AGYS	45203030	Technology Distributors
CAPITAL ONE FINANCIAL CORP	COF	MBNA CORP	KRB	40202010	Consumer Finance
CATALINA MARKETING CORP	POS	EMAK WORLDWIDE INC	EMAK	25401010	Advertising
CHECKPOINT SYSTEMS INC	CKP	PAXAR CORP	PXR	45203010	Electronic Equipment Manufacturers
DISNEY (WALT) CO	DIS	VIACOM INC	VIA.B	25401030	Movies & Entertainment
EATON CORP	ETN	INGERSOLL-RAND CO LTD	IR	20106020	Industrial Machinery
EQUIFAX INC	EFX	TRANSAMERICA FINANCE CORP	TA2	20201030	Diversified Commercial Services
FEDEX CORP	FDX	RYDER SYSTEM INC	R	20301010	Air Freight & Logistics
FIRST DATA CORP	FDC	FISERV INC	FISV	45102020	Data Processing & Outsourced Services
HARRAHS ENTERTAINMENT INC	HET	MGM MIRAGE	MGM	25301010	Casinos & Gaming
HUNTINGTON BANCSHARES	HBAN	SYNOVUS FINANCIAL CP	SNV	40101015	Regional Banks
ITRON INC	ITRI	ORBOTECH LTD	ORBK	45203010	Electronic Equipment Manufacturers
KEYCORP	KEY	BB&T CORP	BBT	40101015	Regional Banks
LSI LOGIC CORP	LSI	MAXIM INTEGRATED PRODUCTS	MXIM	45301020	Semiconductors

Patenting Firm Company Name	Ticker Symbol	Nonpatenting Competitor Company Name	Ticker Symbol	GICS Sub-Industry	GICS Sub-Industry (Description)
MAPINFO CORP	MAPS	EVANS & SUTHERLAND CMP CORP	ESCC	45103010	Application Software
MATTEL INC	MAT	BRUNSWICK CORP	BC	25202010	Leisure Products
MCGRAW-HILL COMPANIES	MHP	TRIBUNE CO	TRB	25401040	Publishing
MEDTRONIC INC	MDT	BOSTON SCIENTIFIC CORP	BSX	35101010	Health Care Equipment
MENTOR GRAPHICS CORP	MENT	COGNOS INC	COGN	45103011	Application Software
MICRO GENERAL CORP	MGEN	MAGIC SOFTWARE ENTERPRISES	MGIC	45103010	Application Software
NEOMEDIA TECHNOLOGIES INC	3NEOM	FIRSTWAVE TECHNOLOGIES INC	FSTW	45101010	Internet Software & Services
NOVELL INC	NOVL	SYMANTEC CORP	SYMC	45103020	Systems Software
PEOPLESOFT INC	PSFT	COMPUWARE CORP	CPWR	45103010	Application Software
PROGRESSIVE CORP-OHIO	PGR	CNA FINANCIAL CORP	CNA	40301040	Property & Casualty Insurance
RAYTHEON CO	RTN	GENERAL DYNAMICS CORP	GD	20101010	Aerospace & Defense
REUTERS GROUP PLC	RTRSY	TRIBUNE CO	TRB	25401040	Publishing
SYMBOL TECHNOLOGIES	SBL	AVX CORP	AVX	45203010	Electronic Equipment Manufacturers
UNITED PARCEL SERVICE INC	UPS	RYDER SYSTEM INC	R	20301010	Air Freight & Logistics
VALASSIS COMMUNICATIONS INC	VCI	HARTE HANKS INC	HHS	25401010	Advertising
WEBMD CORP	HLTH	RENAL CARE GROUP INC	RCI	35102015	Health Care Services