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Financial impact of legal practice on software patent subject matter eligibility: Effectiveness of a workable standard

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Abstract

This article examines the financial impact of software patent subject matter eligibility by analyzing divergent legal practices by courts and administrative bodies. We illustrate these effects by empirical evidence relating to case-law decisions, notably *Alice Corp. Pty. v. CLS Bank International* (hereafter, *Alice v. CLS Bank* or *Alice*). In order to eliminate the ambiguity of legal practice of these two systems in relation to patent law, the patent office has been inspired by and aligned with the work of the judicial system and developed an analytical model concerning the application of the law. The effectiveness of this workable standard is then evaluated on the basis of its influence on firm value. The results suggest that the publication of the workable standard, the United States Patent and Trademark Office (USPTO) Interim Guidance, has had a significant positive impact on companies which have completely modified their patent strategies in line with the new USPTO policy. We conclude that the uniformity of legal approach by the judicial and administrative systems decreases legal uncertainty and contributes to financial performance. Consequently, a workable standard with clear and precise legal approaches enables the patent system to develop efficiently.

Keywords: Software, Patent, USPTO, Innovation, Firm Value.

JEL classification: G30, D22, O34, O38

1. Introduction

In the last ten years, an increase in the number of software patents granted by the patent office, the United States Patent and Trademark Office (USPTO), has reignited the long-standing debate on software patent subject matter eligibility, notably with regard to the application of the legal practice of the patent office and of the judicial system in relation to software patentability (Merges, 1999; Lemley, 2001; Jaffe and Lerner, 2004; Meurer, 2009) and the financial impact of this patentability on companies (Dreyfuss, 2000, 2001; Hunt, 2001; Lunney, 2001; Bakels and Hugenholtz, 2002; Meurer, 2002; Ernst, 2003; Lemley et al., 2005).

The patent office and the judicial system interpret and apply the Patent Act¹, which is authorized by the United States Constitution and is interpreted on the basis of case-law. These two independent systems use different approaches in applying patent law to software inventions: the USPTO uses administrative processes based on a rule-making approach and the judicial system interprets patent law on a case-by-case basis.

The USPTO prosecution process for granting software patents has engendered discussions among academics. In particular, critics are concerned that the USPTO pro-patent policy, which expands the boundaries of software patent subject matter eligibility, leads to a substantial number of invalid software patents (Heller and Eisenberg, 1998; Cohen et al., 2001; Lemley, 2001; Meurer, 2009; Lichtman and Lemley, 2010). The literature has attributed this USPTO dysfunction to several causes: the lack of funding means that USPTO examiners are unable to

1. United States Code Title 35 – Patents. This title was enacted by act of July 19, 1952, ch. 950, §1, 66 Stat. 792.

spend a long time identifying prior art information (Dreyfuss, 2006; Lemley and Sampat, 2008); the inefficient management does not provide the correct incentive to grant valid patents (Jaffe and Lerner, 2004; Bronsteen, 2007); and the lack of rigor by the USPTO in its examinations results in the protection of inappropriate patents (Baird 2001; Quillen and Webster, 2001; Thomas, 2002; Kesan, 2002).

The dysfunction within the patent system in relation to software patent subject matter eligibility also involves the judicial system, notably when the courts review USPTO decisions on patentability. The courts have received sharp criticism for their different and opposite positions on the handling of judicial cases relating to software patents (Dratler, 2005). Several studies explain this systemic problem by the fact that the courts do not have genuine expertise in new technologies, in particular in the software industry (Janis, 2000; Wagner and Petherbridge, 2004).

Despite the disagreement on the cause of these previous problems in the two systems, researchers recognize that the validity of software patents has an important impact on the valuation of patent-holder companies (Ernst 1998; Hall 2000). The validity of a software patent influences a company's financial performance (Macdonald, 2004; Somaya, 2012). Firstly, a software patent can make it possible to generate growth in productivity and thus increase revenue from company activities, given that a patent is considered as the output of technically successful innovation in research and development activities (Griliches, 1990). Secondly, a software patent provides legal comfort for investors who expect a financial return from their funding, by mitigating risks and increasing the incentive to invest in expenditure on research and development (Dam, 1993). This is due to the fact that patent protection prohibits others from

using a wide variety of patented products, processes, technologies and other features for a fixed period of time (Cohen and Lemley, 2001)². Thirdly, a software patent creates extra financial revenue from license royalties and fees for firms (Piccoli and Ives, 2005). Fourthly, challengeable patents can lead to direct and indirect financial costs. Specifically, appeals and reversals are costly in monetary and reputational terms for patent-holder firms (Lemley, 2001; Encaoua and Lefouili, 2005; Shane and Somaya, 2007; Meurer 2009).

In order to respond to the dysfunction of the patent system, academics have suggested various solutions. Jaffe and Lerner (2004) propose additional funding for the USPTO for its operational activities. Allison and Lemley (2002) suggest USPTO internal regulations that provide an incentive for examiners to grant valid patents. Kieff (2003) proposes a simple registration system and the abolition of patent examinations.

Notwithstanding the different theoretical approaches regarding the causes of and the solutions to this dysfunction in relation to software patent subject matter eligibility, our article offers a different explanation for this dysfunction, namely the divergence of legal approaches between the patent office and the judicial system. This explanation provides an insight into the application of patent law in relation to software patent subject matter eligibility. This is because even if all of these other potential causes were eliminated, this structural problem would persist, driven by the divergence of the legal practice of the two institutions in relation to software patent subject matter eligibility.

2. Cohen and Lemley (2001) assert that large software companies use patents as a strategy to remain a market leader and block innovation by competitors in the same sector by filing a significant number of broad patents.

In the literature on software patentability, most studies employ event studies to assess the impact of an individual judicial decision applicable to the software sector (Hall and MacGravie, 2010). Hall and MacGravie's study used all of the companies of the software industry as a sample and focused on the application of a specific piece of case-law. Our research differs from this in that it studies a structural problem within the patent system that relates to the divergence of legal practice within the judicial and administrative systems. We use a specific piece of case-law as an example in order to illustrate this systemic problem.

In this paper, our hypotheses are firstly that software patentability has not a financial impact on firm value and secondly that the USPTO's new standard is an efficient means for companies to anticipate litigation risk. This empirical research is based on judicial and administrative decisions relating to *Alice Corp. Pty. v. CLS Bank International* (hereafter, *Alice v. CLS Bank* or *Alice*). We employ the methodology of event study³ to test these hypotheses. *Alice v. CLS Bank* is drawn upon for two reasons: the first reason is that in this case the Supreme Court took a clear position in its decision and developed an analytical method; the second reason is that the USPTO for the first time drafted a workable standard in relation to Section 101 of Title 35 of the United States Code (35 U.S.C. § 101).

We subsequently investigate whether the USPTO workable standard is effective. The literature suggests that the restriction of patent scope can decrease legal uncertainty for patent-holder firms (Griliches, 1990), as a strong patent can reduce the possibility of software patents

3. Griliches (1990) notes that efforts to explain the level of stock market valuations using patent-based measurements have been disappointing. In general, patent-based measurements have explained only a minute fraction of valuations. Thus, an event study might appear the best way to assess the value of patent scope.

being contestable before the courts in relation to their patent subject matter eligibility by competitors (Thomas, 2003). The effectiveness of this workable standard is evaluated by empirical methods.

With regard to the data for this study, our entire sample is based on companies which are indirectly involved in the *Alice* case⁴. The subgroups of the sample are constituted on the basis of their expert opinions that were provided to the Supreme Court. In contrast with other studies relating to software patent subject matter eligibility, our study is not limited to one particular sector. By contrast, in the literature, empirical investigations concerning the evaluation of the effect of case-law in relation to software patents refer to listed firms in the same sector (Hall and MacGravie, 2010; Eberhardt et al., 2016).

Our findings provide empirical evidence for the financial impact of software subject matter eligibility on firm value. The results suggest that the courts' jurisprudence on patentability has no influence on the valuation of firms. However, the publication of the new USPTO guidance has a significant and positive effect on the firms supporting the petitioner, Alice Corporation. We can conclude that the uniformity of the legal practice of courts and administrative bodies is able to improve the quality of software patents, reduce legal uncertainty and contribute to an increase in the valuation of firms. Consequently, a workable standard provided by the USPTO which is aligned with the legal practice of the judicial system is effective for patent-holder firms.

Part II provides background information on software patent subject matter eligibility in *Alice v. CLS Bank* and presents in more detail the workable standard applied by the patent office. Part

4. See Infra Part 3.

III describes our data. Part IV provides a structural analysis of the importance of a workable standard. Part V presents our discussion. Part VI focuses on a brief conclusion.

2. Software subject matter eligibility under 35 U.S.C. § 101 in *Alice*

For software inventions, a multitude of approaches have been employed by the Federal Circuit and the Supreme Court, and the opposite and divergent positions that have been taken by each institution have led to confusion surrounding the patentability of such inventions⁵. Despite the fact that the Supreme Court had been reluctant to weigh in on many of the most important cases (Masur, 2015), it did take a position and give a decision on patentability in the *Alice* case (Masur, 2015).

In the *Alice* case, the patents involved concern a scheme/method for mitigating settlement risk. Said risk refers to the risk that only one party to an agreed-upon financial exchange will satisfy its obligation. In *Alice*, a computer system is used as a third party intermediary between the parties to the exchange. For the *Alice* case, the scope of the patent claims relates to a method

5. See: *re Prater*, 415 F.2d 1378 (C.C.P.A. 1968).

re Bernhart, 417 F.2d 1395 (C.C.P.A. 1969).

Gottschalk v. Benson, 409 U.S. 67 (1972).

Parker v. Flook, 437 U.S. 584 (1978).

Diamond v. Diehr, 450 U.S. 175, 184 (1981).

State St. Bank & Trust Co. v. Signature Fin. Grp., 149 F.3d 1368 (Fed. Cir. 1998).

re Bilski, 545 F.3d 943, 959 (Fed. Cir. 2008).

constructed to manage financial obligations, a computer apparatus arranged to carry out the method, and a computer readable medium comprising program code to execute said method⁶.

On March 9, 2011 the District Court held that all of the claims were ineligible for patent protection under 35 U.S.C. § 101, as they were directed to the abstract idea of “*employing a neutral intermediary to facilitate simultaneous exchange of obligations in order to minimize risk.*”⁷ The principal reason for excluding abstract ideas is to prevent monopolies on high-level ideas blocking innovations⁸.

On May 10, 2013, the Federal Circuit affirmed the judgment of the District Court and considered the patent claims to be ineligible subject matter under 35 U.S.C. § 101⁹.

On June 19, 2014, the U.S. Supreme Court affirmed the judgment of the United States Court of Appeals for the Federal Circuit (CAFC) and considered that the method claims were ineligible because the claims recited “*nothing significantly more*” than the teaching to implement an abstract idea, namely an intermediated settlement, with a non-specific computer. Moreover, as the non-specific computer recited in the claims added nothing more to the abstract idea, the other independent claims relating to computer systems and computer-readable media were considered as non-patentable¹⁰.

The most important contribution of the Supreme Court is an analytical method which consists of a two-step test to determine whether an invention is eligible for patentability under §

6. US Pat. 5970479, US Pat. 6912510, US Pat. 7149720, and US Pat. 7725375.

7. *CLS Bank Int'l v. Alice Corp.*, 768 F. Supp. 2d 221 (D.D.C. 2011).

8. *Alice Corp. Pty. Ltd. v. CLS Bank Int'l*, 134 S. Ct. 2357–58 (2014).

9. *CLS Bank Int'l v. Alice Corp.*, 717 F.3d 1269 (Fed. Cir. 2013).

10. *Alice Corp. Pty. Ltd. v. CLS Bank Int'l*, 134 S. Ct. 2357–58 (2014).

101¹¹. The two-step method is as follows: it is first determined whether the claim is directed to an abstract idea. If so, the claims as a whole, it is determined whether, beyond the abstract idea, any additional feature in the claim is able to transform the *a priori* abstract idea into patent-eligible subject matter¹².

On December 16, 2014, the USPTO officially issued the Interim Guidance, which is based on clear rules, accurate steps and precise examples for determining software patent subject matter eligibility¹³. The USPTO Interim Guidance is aligned with the decision of the Supreme Court, which aimed to identify whether an invention related to software comprises technical features transforming the nature of the claim¹⁴. These USPTO guidelines reflect the USPTO's willingness to improve the functioning of the patent system by aligning its legal practice on software patent subject matter eligibility with that of the judicial system¹⁵.

3. Data

We hand-collected our sample from the archive of the Supreme Court of the U.S¹⁶. We identified 41 *amicus curiae* briefs, in which companies had provided information and expertise

11. See *Alice Corp. Pty. Ltd. v. CLS Bank Int'l*, 134 S. Ct. 2357–58 (2014).

12. See *Alice Corp. Pty. Ltd. v. CLS Bank Int'l*, 134 S. Ct. 2357–58 (2014).

13. Federal Register, Vol. 79, No. 241, Tuesday, December 16, 2014 / Rules and Regulations.

14. AIPLA, Re: Request for Comments on July 2015 Update on Subject Matter Eligibility, 80 Fed. Reg. 45429, October 28 2015.

15. AIPLA, Re: Request for Comments on July 2015 Update on Subject Matter Eligibility, 80 Fed. Reg. 45429, October 28 2015.

16. The official website of the U.S. Supreme Court.

to assist the decision of the Supreme Court in the *Alice* case. Each *amicus curiae* brief contains arguments from a number of companies, lawyers and/or associations on software patent eligibility. In order to constitute our sample, we extracted different companies from each brief and excluded non-publicly listed firms for the purposes of the event study methodology. Finally, we hand-selected 33 listed companies as entire sample. The companies in our sample are active in the fields of online searching, advertising, commerce, social networking, gaming, web hosting, computing, and related products and services.

We constitute our subgroups of the sample on the basis of the different opinions of the companies identified in the aforementioned briefs. Three positions have been identified in this case: in support of the petitioner (Alice Corporation), in support of the respondent (CLS Bank), and in support of neither party.

The first group comprises companies supporting the petitioner, Alice Corporation. They are in favor of a test which allows software inventions to be patent-eligible and consider the *Alice* patent claims to be eligible subject matter. These companies consider that the current patent law does allow the promotion of innovation and prefer broad claims¹⁷.

The second group is composed of firms supporting the respondent, CLS Bank. They are opposed to software inventions being patent-eligible and consider the *Alice* patent claims to be

17. Brief for Trading Technologies International, Inc., Cantor Fitzgerald, L.P., Cummins Inc., Scientific Games Corporation, Align Technology, Inc., et al., in Support of Petitioner.

ineligible subject matter. These firms consider that the patentability of software inventions harms innovation and prefer narrow claims¹⁸.

The third group consists of companies not supporting either party. These companies argue in favor of a clear and objective test for determining the patentability of software inventions which should preclude the patentability of high-level abstract ideas¹⁹.

4. Results

4.1. Event study

We analyze stock market reactions to the decisions of the courts and of the patent office for all companies indirectly involved in the *Alice* case. The various decisions on *Alice v. CLS Bank* are analyzed by way of an event study and measured as abnormal returns in financial markets for companies affected by those events.

With regard to the decisions of the courts, if including business software within patentable subject matter increases firm value, we would expect a decision upholding software patentability to have a positive effect on the firm value of companies holding said patents. In contrast, if software patents generate costs for companies, significant negative abnormal returns should be

18. Brief for Google Inc., Amazon.com Inc., American Association of Advertising Agencies, Dell Inc., Facebook, Inc., Intuit Inc., LinkedIn Corp., Netflix, Inc., Rackspace Hosting, Inc., Verizon Communications Inc., and Zynga Inc. in Support of Respondents.

19. Brief for International Business Machines Corporation in Support of Neither Party.

expected. If the abnormal returns are not significant, this means that there is no effect on the firm value and that the decisions might be able to be anticipated by firms.

Regarding the new USPTO guidance, this legal practice is provided by the patent office and aims to clarify the interpretation of the law. If the publication of the USPTO guidance results in positive abnormal returns for companies, we can conclude that the application of the new guidelines makes a positive contribution to financial performance. On the other hand, we can expect significant negative abnormal returns if the publication of the USPTO guidance is able to decrease a company's value where that company's current IP strategy on patent filing is not compatible with the USPTO guidance. On that basis, the validity of their patents would be challenged by competitors. If the abnormal returns are not significantly different from zero, the publication thus has no effect on a company's value. In other words, companies' patent practices are not influenced by the new guidelines. An explanation may be that the previous patent practice is similar to the new guidance and companies do not need to adopt a new approach in their patent strategy. Pisano (2016) asserts that as rational economic entities, these companies should modify their previous patent strategy by narrowing the scope of the claims during the patent prosecution before the USPTO.

Table 1 reports the initial stock market reactions to the decisions of the courts and the patent office. Average Abnormal Returns (AAR) are calculated for the event date and Cumulative Average Abnormal Returns (CAAR) are computed over three different event windows, adopting the Constant Mean Return Model. In general, the decisions of courts do not involve significant abnormal returns for all companies, the publication of the USPTO interim guidance is

significantly and positively associated with abnormal returns for companies supporting the petitioner, and abnormal returns are not significant for the other firms supporting the respondent or supporting neither party. In addition, our finding demonstrates that, for innovative firms, the clarification of software patent rules in the grant procedure is more important than patent subject matter eligibility *per se* in the opinions of the firms that have taken a position in the *Alice* case. This is due to the fact that these firms determine their patent strategies in accordance with the USPTO legal practice.

With respect to the decisions of the District Court of March 9, 2011, the Federal Circuit of May 10, 2013 and the Supreme Court of June 19, 2014, there are no abnormal returns for any firms on the date of announcement and during the event windows. The results are not statistically significant.

It should be noted that the Supreme Court drew up an analytical method in its decision for the purposes of defining precisely the term “abstract idea” in relation to software patent subject matter eligibility. This method has subsequently been reconsidered in the new USPTO guidance. However, the aforementioned lack of impact is explained by the fact that the decision of the Supreme Court was anticipated by the financial markets three months before the official decision.

According to the Factiva database, on April 1, 2014 Communications Daily pointed out that it was seen as likely that the Supreme Court would interpret patentability narrowly as another two cases in February 2014 involving health and fitness industry patents are likely to determine when a court can use fee-shifting to award attorney’s fees to the party that wins a case. However,

in contrast with the decisions of the District Court and of the CAFC, the first appearance of public news on *Alice v. CLS Bank* appeared in the New York Law Journal on July 24, 2013, which is two months after the decision of the CAFC on May 10, 2013. Hence, the decisions of the District Court and the CAFC were not anticipated by the financial markets. These two decisions did not have a significant effect on the valuation of companies. This is due to the fact that the lack of a workable standard provides freedom of interpretation with regard to legal approaches in relation to software patent subject matter eligibility, and therefore the USPTO does not take the courts' decisions into account. On December 16, 2014, the USPTO published its new guidelines, the USPTO Interim Guidance. This publication had a significant and positive effect on companies supporting the petitioner.

The estimates presented in Table 1 suggest that the results are positive and significant for the group supporting the petitioner in relation to the publication of the USPTO Interim Guidance on December 16, 2014. For the event windows (0,+1) and (-2,+2), the CAARs are 3.50% and 3.35%, respectively. By contrast, in the case of companies supporting the respondent and supporting neither party, the financial markets do not react significantly to the event of the publication.

These results are confirmed by Figure 1. It illustrates the number of US patents granted per financial year for each group. This data is collected from PATBASE²⁰. The grant numbers increase in 2014 and 2015 for the groups supporting the respondent and the neutral group, in contrast to the group supporting the petitioner, for which the number reduces sharply.

20. We collected data from PatBase analytics.

Figure 1: Grant number of the three subgroups

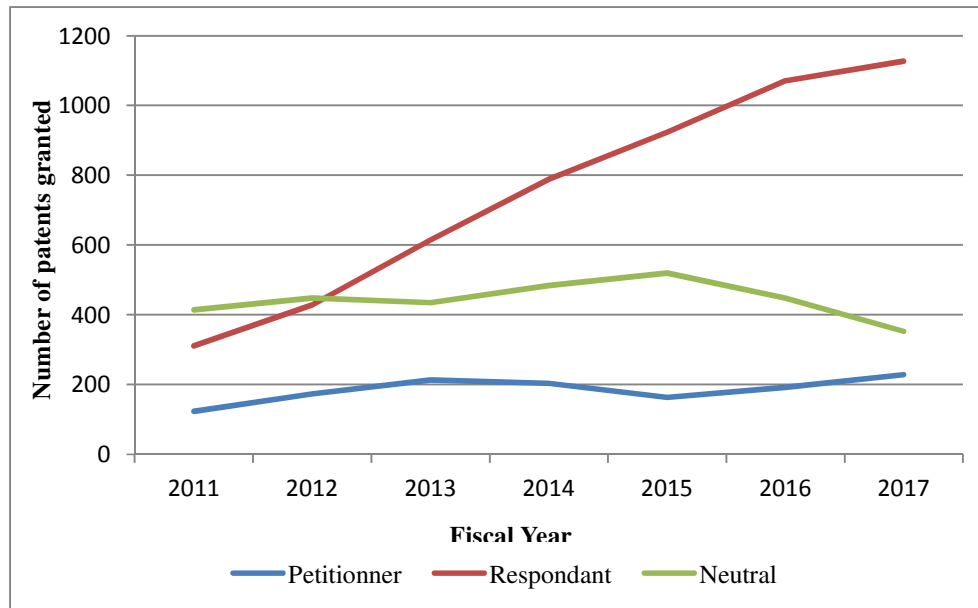


Figure 2 shows that the growth in grants for the companies supporting the petitioner fell sharply, with a 20% decrease in 2015. This phenomenon is explained by the fact that their current patent practice is not compatible with the new guidelines. Indeed, in their *amicus curiae* briefs, they support the grant practice that permits software patents with a large scope. However, the new guidelines limit the protection and prohibit the protection of an abstract idea, even in combination with a standard computer²¹. They urge companies to make their new patents stronger than their previous patents. New, stronger patents are less open to challenge by competitors²² and may exclude competitors and increase the companies' licensing revenue,

21. Federal Register, Vol. 79, No. 241, Rules and Regulations, December 16, 2014.

22. Competitors hesitate to challenge such patents before the courts, as the likelihood that such patents are invalid under 35 U.S.C. § 101 is low and the financial cost is significant.

thereby contributing to the positive effect on company valuation²³. In Figure 2, we can see that a year after the effective date of the USPTO interim guidance on December 16, 2014, the growth in grants is 17% and 19% for 2016 and 2017 respectively²⁴.

Figure 2: Growth in grants for the three subgroups

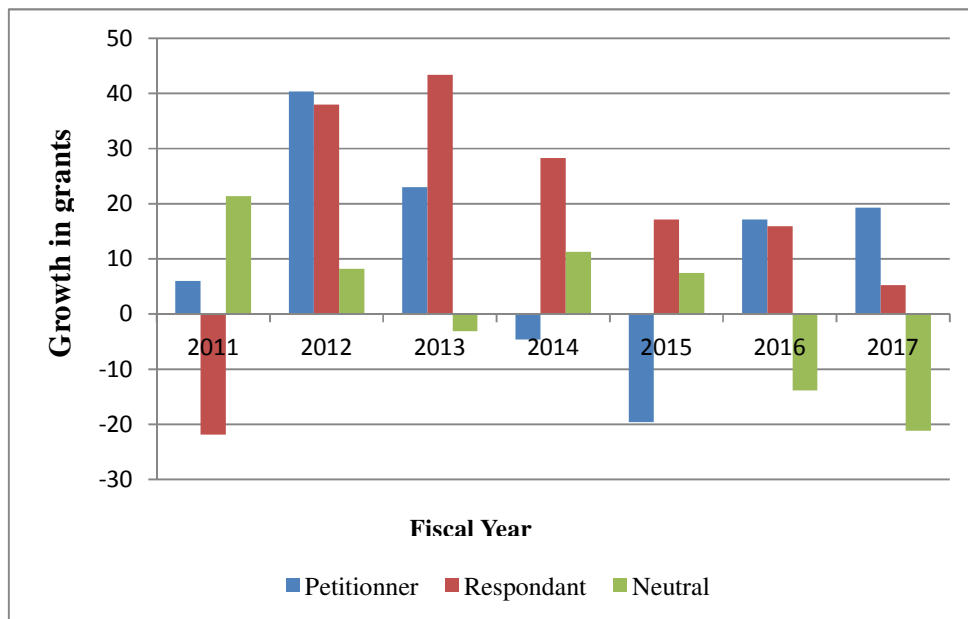


Table 1 shows that there is no financial effect on firms supporting the respondent or on those not supporting either party. The growth in grants for the group supporting the respondent and the group not supporting either party increased by 17% and 7% respectively in 2015. These rates are close to the rates of increase of 28% and 11% respectively for the previous year, 2014. This is

23. Cockburn and MacGarvie (2006) find evidence that firms holding patents are more likely to enter software markets. However, increases in the extent of patenting by other firms in the market reduce the rate of entry. Hall et al. (2000) find that firms in the ICT sector that entered the publicly traded sector after changes in patenting behavior in this sector in the mid-1980s have much higher patent valuations than those that entered earlier.

24. We collected data from PatBase analytics.

because these companies' current patent practice, which requires clear rules, is similar to the USPTO's new approach to patentability. Accordingly, before the *Alice* case they had already adopted clear rules in their patent practices in order to obtain high-quality patents. Therefore, the new USPTO guidelines have not impacted on those companies' value.

4.2. Impact of the new patent practice before the USPTO

Since the implementation of the new USPTO guidelines, a significant number of software patents granted before the *Alice* decision have been declared invalid by the USPTO (Tran, 2016). Table 2 reports the rejection rate under § 101 for Art Units of Technology Center 3600. This table shows the comparison between two periods: before and after the *Alice* case. The period before *Alice* comprises the financial year 2013 and the period after *Alice* consists of the period from the publication of the Interim Guidance on December 15, 2014 to July 30, 2015. Technology Center 3600 has eight individual art units that handle specific types of e-commerce technologies. Here we see that this work group has a significantly high rate of § 101 rejections, between 64% and 95%. In the pre-*Alice* period, the § 101 rejections were between 15% and 50%. For the specific Art Unit 3690 relating to Business Methods implemented by software, the increase is significant: from 21% to 94%.

Table 2: Rate of rejection under § 101

<i>Technology center 3600</i>	<i>Before Alice Percent</i>	<i>After Alice Percent</i>
Art Unit		
3621 - Business Cryptography	39%	64%
3629 - Business Processing	50%	92%
3628 - Cost, Price, Reservations, Transportation	33%	84%
3625 - E-Shopping	30%	86%
3626 - Health Care, Insurance	24%	89%
3622 - Incentive Programs, Coupons	24%	90%
3624 - Incentives, E-Shopping, Insurance, Retail	24%	90%
3623 - Operations Research, Voting	31%	95%
3627 - Point-of-Sale, Inventory, Accounting	15%	66%
3690 - Finance and Banking	21%	94%

Source: AIPLA, 2016

Under the previous USPTO Guidelines, a generic computer in a claim relating to software for a business method had been sufficient to overcome rejection under § 101. However, the new Guidelines increase the rejections under § 101, in particular when a claim related to software for a business method comprises a generic computer that presents *'nothing significantly more'* than the fact of implementing the business method. The new guidelines give examples to help to determine whether the computer generates something significantly more.²⁵

5. Discussion

The empirical data confirms both hypotheses of our research model by virtue of the event study methodology. Our model consists of assessing the financial impact of software patent subject matter eligibility on firm value and evaluating the effectiveness of a workable standard for the grant of software patents. The following discussion will be divided into four parts:

25. See supra Part 2.

5.1. The theoretical contribution of the study

Existing research on software patent subject matter eligibility demonstrates that software patent possession increases firm value (Ernst, 1998; Hall, 2000) and the validity of software patents has an effect on a patent-holder company's financial performance (Macdonald, 2004; Somaya, 2012). In contrast with these studies, our research shows that the decisions of courts on software patentability in accordance with the *Alice* case have not impacted on the valuation of firms which have taken positions in this case. This finding is in accordance with Hall and MacGravie (2010), who consider that software patentability has no significant effect on firm value for the software sector.

Our theoretical proposition on the cause of the dysfunction with regard to software patentability is that this is down to the divergence of legal approaches between the patent office and the judicial system. In this theoretical context, Rai (2003, 2004) asserts that few studies evaluate the application of legal doctrine in relation to software patents. In addition, there is no study which advocates a reform of the patent system for administrative and judicial institutions. Our research subsequently proves this hypothesis by testing the effectiveness of the new USPTO guidelines aiming at the uniformity of the legal approach adopted by the judicial and administrative systems. The empirical results show the positive statistical significance of the establishment of the new USPTO guidelines for companies supporting the petitioner in the *Alice* case. Our research finding indicates that a strong patent can reduce the possibility of software

patents being contestable before the courts and anticipate litigation risk. In accordance with Lemley (2001), Thomas (2003), Encaoua and Lefouili (2005), Shane and Somaya (2007) and Meurer (2009), the empirical results demonstrate that strong software patents are inherently more perfect and more certain.

Based on this empirical research, our theoretical contribution is to identify empirically the structural dysfunction of the judicial and administrative systems in relation to software patentability and provide a method standardizing and harmonizing legal approaches by courts and administrative bodies in order to eliminate this issue.

The originality of our study is that, firstly, this empirical research uses a specific piece of case-law as an example to illustrate these systemic issues; secondly, with regard to the data for this study, our entire sample is based on companies indirectly involved in the *Alice* case. The subgroups of the sample are established on the basis of the parties' expert opinions that were submitted to the Supreme Court. In contrast with all other studies, notably Hall and MacGravie (2010) and Eberhardt et al. (2016), our study is not limited to one specific sector.

5.2. Practical conclusions of this study

On the basis of this empirical study, we conclude that the financial markets take an interest in the patent strategy pursued by firms, which strictly reflects the legal practice of the patent office in relation to the grant of patents, rather than in the patentability of individual software inventions. The workable standard provides clear rules, which are considered to be a filter for

determining whether a software invention is patent-eligible under § 101, such as in relation to business methods. This filter makes it possible to exclude inventions relating to high-level abstract ideas, to which freedom to operate is generally considered to apply. This USPTO Interim Guidance modifies the legal practice of the USPTO. The substantial increase in the rejection rate at the USPTO underscores the clear and restrictive approach adopted by the USPTO and shows the improvement in the quality of software patents granted by the USPTO. This suggests that the USPTO interim guidance has had a significant effect on the approach to the grant of patents.

5.3. The limitations of the study

The *Alice* case was the first piece of case-law in which the Supreme Court took a clear position on software patent subject matter eligibility and the USPTO ruled accordingly. Therefore, our empirical research is limited to one specific technical field in one given country. Future studies would include other case-law decisions in other technical fields and build up a general theoretical approach.

5.4. Potential further research

Firstly, patent systems operate independently and the divergence in terms of patentability between different countries is significant. Based on our theoretical and empirical research framework, it would be possible for future research to extend our study to other countries or

territories. Secondly, high technology and innovation are influencing our society to an increasing extent, and firms are employing patent strategy to anticipate technology innovation and keep their competitive advantages. Strategic management as regards high technology and innovation depends fundamentally on patent-related selections and decisions. Future studies would develop our research by working on several areas concerning the influence of the application and implementation of the USPTO's legal approach to the grant of patents on the management of patent strategy.

6. Conclusion

In this article, we have evaluated the financial impact of software patent subject matter eligibility on companies that have taken positions in *Alice v. CLS Bank* in order to identify the effectiveness of a workable standard provided by the patent office. Our analysis of market returns demonstrates some clear patterns: it is emphasized that there is no reaction from financial markets to the decisions of the courts. We further illustrate that the financial markets indicate a heterogeneous response for different groups that have taken positions in the *Alice* case concerning the publication of the new USPTO Interim Guidance on December 16, 2014. Our findings suggest that the alignment of the patent office with the decisions of the Supreme Court generates a positive financial effect on companies supporting the petitioner. Because the firms supporting the petitioner employed the former USPTO practice to obtain broad patent protection, the validity of their patents was highly contestable. By contrast, there was no financial effect on

companies supporting the respondent or those not supporting either party, which used a practice close to the new practice defined by the USPTO. This workable standard, which is built on the work of the Supreme Court and established by the USPTO, provides a clear legal approach for the application of patent examinations. These results demonstrate that the workable standard is effective for the patent system due to the fact that this legal framework improves the quality of software patents and reduces legal uncertainty, thereby contributing to the proper functioning of the patent system.

Table 1: Abnormal returns to companies in relation to decisions of the courts and the USPTO. The sample consists of observations of all companies indirectly involved in *Alice v. CLS Bank*. The companies showed no reaction to the decision of the District Court of June 9, 2011 or that of the CAFC of May 10, 2013; abnormal returns for these companies were not significantly different from zero. Before the decision of the Supreme Court of June 19, 2014, these companies had taken positions in the *Alice* case, and three groups are formed in the subsample: the group supporting the petitioner, the group supporting the respondent and the group not supporting either party. None of these three groups had significant abnormal returns following the decision of the Supreme Court. The publication of the USPTO interim guidance on December 16, 2014 positively and significantly influences the group supporting the petitioner for the event windows (0,+1) and (-2,+2). AAR represents abnormal returns for the date of the event and CAAR describes cumulative abnormal returns for each corresponding event window. KP interprets the parametric test of Kolari and Pynnonen (2010).

		Entire sample			Petitioner			Respondent			Neither		
		<u>AAR (%)</u>	<u>CAAR (%)</u>	<u>KP</u>	<u>AAR (%)</u>	<u>CAAR (%)</u>	<u>KP</u>	<u>AAR (%)</u>	<u>CAAR (%)</u>	<u>KP</u>	<u>AAR (%)</u>	<u>CAAR (%)</u>	<u>KP</u>
03/09/2011	(0,0)	-0.36		-0.2129									
	(0,+1)		-2.03	-1.5304									
	(-1,+1)		-1.62	-1.0553									
	(-2,+2)		-2.38	-1.6368									
	(-3,+3)												
05/10/2013	(0,0)	0.67	-	1.3891									
	(0,+1)	-	0.57	0.0557									
	(-1,+1)	-	0.02	-0.5816									
	(-2,+2)	-	0.82	0.2368									
	(-3,+3)												
06/19/2014	(0,0)	-0.32	-	-0.2799	-0.08	-	-0.2239	-0.45	-	-	-0.59	-	-1.3504
	(0,+1)	-	-0.51	-0.3713	-	-0.12	-0.2491	-	-0.77	-	-	-0.63	-1.0127
	(-1,+1)	-	0.42	0.2825	-	0.43	0.2439	-	0.31	0.3760	-	0.21	0.0591
	(-2,+2)	-	-1.22	-0.0340	-	-12.03	-0.3412	-	2.40	1.2940	-	1.51	0.6843
	(-3,+3)												
12/16/2014	(0,0)	-1.17	-	-0.8997	0.85	-	0.2593	-2.34	-	-	-0.99	-	-0.8185
	(0,+1)	-	1.11	0.5889	-	3.50	1.7608*	-	0.18	0.2000	-	0.85	0.3667
	(-1,+1)	-	0.85	0.2983	-	3.78	1.5728	-	-0.67	-	-	0.87	0.1427
	(-2,+2)	-	2.15	0.9607	-	3.35	2.1966**	-	0.90	0.4327	-	3.15	1.0549
	(-3,+3)												

* = Significant at the 10% confidence level; ** = significant at the 5% level; *** = significant at the 1% level.

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