The Multi-Touch™ patent: software cold war in the ICT industry
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0. Abstract

The ICT industry had undeniably seen a growing importance of software in the recent years, especially within the mobile telephony sector. New portable devices are becoming closer, in terms of computing capacity, to personal computers. The software on those devices is no longer embedded in the topography of circuits: smart-phones and PDAs can execute object code and scripts, and have become platforms for which third parties programs can be easily developed.

Moreover, within such industry, elements such as “user experience” and “look and feel” have become key factors for a product to successfully reach the mass market. In addiction, the fierce turnover speed at which new technologies break into the industry makes this environment extremely challenging from an IP management perspective. Therefore, in order to succeed, a firm needs a strategy balancing valuable innovation and timing.

In addiction to the highly dynamic nature of the industry, software itself brings further uncertainty to the manager. In fact, software is generally speaking one of the most controversial IP subject-matter. In the last decade, it has grown its role with respect to hardware within a wide set of industries, ranging from (obviously) personal computers, automotive, information
technology, telecommunications. Formerly embedded within the integrated circuits, software nowadays accounts for the majority share of a product value. It has been widely debated which IP form is the more suitable protection whereas software came under the form of source code, object code, was hardware-embedded or was simply intended as the algorithmic solution to a given problem. As I will analyze, the concepts of algorithm and performing function are recurrent in the “software patents” debate.

Within this very dynamic and uncertain environment, one of the most recent innovation has been the multi-touch technology, brought to the market by Apple. The so called “multi-touch patent” has been widely discussed. The technology has been recently claimed to fall within the scope of prior art and to be in conflict with other patents owned by other players (namely Elan and Palm). Apple’s patent hasn’t been questioned until recently¹. The first issue I will therefore investigate is whether or not Apple can claim exclusiveness on the multi-touch technology, and to which extent can the multi-touch be implemented on non-Apple devices.

The Apple case carries a number of questions, not just from legal but also from a corporate strategy perspective. In the consumer’s mind, an undeniable strong association between the iPhone and the multi-touch technology exists, given that, regardless the validity of Apple’s IP, since 2007 on the very successful iPhone its devices are the only ones implementing the multi-touch technology until recently. None of Apple’s competitors challenged its patents before Elan, being this a risky decision. It is in fact understood that trials carry remarkably high costs, in terms of money and time, which leads

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to extra-judicial solutions most of the time. Notably, Google’s open source device, Android, already possesses the capabilities to exploit multi-touch, but the producers had chosen to disable the feature, for no official reason.

Therefore, given the frame (uncertainty, timing, resources) the issue I will investigate is: *is Apple’s patent portfolio truly meant to be enforced, or was it rather intended to be used as a bargaining tool in order to keep the competitors away from developing expertise and capabilities within such an uncertain field?*

Which naturally leads to a broader question: *is Apple’s strategy effective?*
1. Introduction

In order to investigate Apple’s effective grip on multi-touch, some background will be needed. In Chapter 2, I will therefore give a short overview of the topics connected with software patentability, from the early development of the industry to the latter issues, such as business methods patenting. Within the US legal system, two cases will be analyzed in depth: the Amazon case (concerning obviousness requirement and business method patenting) and the KSR v. Teleflex case (concerning obviousness requirement).

In Chapter 3, I will investigate whether or not - or better, to which extent - can Apple claim exclusiveness on multi-touch technology especially with respect to Palm and Elan. In order to do this, I will analyze some relevant patents held by Apple as well as the ones held by of Palm and Elan that are relevant to such technology. A comparative citation analysis will be performed to understand the relevance of the IP assets held by every company and their relative strength.

Finally, the purpose of Chapter 4 is to investigate whether or not, in the light of Palm and Elan cases and of competitive scenario faced by modern firms, Apple’s strategy was overall effective.
2. Software patentability

2.1 - Background

Software patentability is still a widely debated subject, on which both the industry and the academics are do not have a uniform opinion. The fact that technology firms themselves have such divergent reactions with respect to other industries (i.e. pharmaceuticals, where there is instead a wide consensus on a strict patent enforcement policy\(^2\)) points out the complexity of the subject matter, which can’t be reconstructed as a clearly defined and unique object.

In fact, a computer program can come under various forms: source code, executable object code, or it can be embedded in the topography of circuits, and finally can be intended as the algorithmic solution to a given task\(^3\). The multiplicity of the forms under which software can come, together with the evolution of the industry in the market and the not-linear legislative response, explains the reason why a mixture of different protection strategies have been historically adopted by the firms. Copyright protects object and source code from copy. Often times, source code is kept secret. Trademarks


\(^3\) R. Pardolesi, M. Granieri, *Il software*, at 3.
and design patents protect the graphical aspects, and patents cover the fundamental functions and algorithms.

In order to understand the legal reasoning beyond software protection, it is worth looking at the evolution of the industry, and the gradual legislative (in fact, judicial) response.

Then, I will analyze two significant cases, that address the fundamental issues of software patenting.

2.1.1 - The early days of software and the first patents

The debate on software patentability begun since the very beginning of software industry. In the early days of the computer industry, software was indissolubly bound to hardware components. The computer industry had, at the time, a strongly oligopolistic structure with a strong vertical integration. Curiously, Bell Labs received what can be considered the first software patent in 1951\(^4\), predating the birth of software industry itself. Although, the very first software patent within the context of software industry was awarded to Martin Goetz years later, in 1968\(^5\). This patent was fundamental for Goetz’s firm competitive position, since at that time the market leader IBM was bundling hardware and software, so that, while purchasing the former, the latter came for free. During the 60’s IBM’s kept its strategy of bundling software and hardware, explicitly because of “our present inability to protect the proprietary use of our programming systems. * * * We must

\(^4\)U.S. patent 2,552,629 (issued May 15, 1951), for “Error-Detecting and Correcting System”.

settle on whether or not, and to what degree, we can protect programs before we can deal adequately with the question of selling them. Therefore, some form of protection was needed for the smaller firm, otherwise its key asset would have been at risk. Nevertheless, until the decision of unbundling hardware and software in ’69, IBM held the position that software patenting was inappropriate. The software trade association representative argued that “the [software] industry had no Federal protection against theft by competitors.” And in fact, at that point software patents were vital for smaller incumbents within the market with respect to the leading hardware firms. The debate on which form of IP protection was more suitable for software had just begun.

2.1.2 - The 70’s and the debate on software protection

It was at the beginning of the 70’s, in *Gottschalk v. Benson*, that the U.S. Supreme Court held unpatentable the claims for an algorithm used to convert binary code decimal numbers to equivalent pure binary numbers. The concept of “algorithm” was defined as a “procedure for solving a given type of mathematical problem”. The Court concluded that such an algorithm, or mathematical formula, is to be considered as a law of nature, and therefore denied patentability.

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6 See Gregory A. Stobbs, *Software Patents* § 1.04[A], at 39 (quoting testimony from 1960’s IBM antitrust litigation).


11 409 U.S. 63 (1972)
The dividing line between what is patentable or not is therefore the concept of algorithm. This initial policy kept by the Court was further confirmed by the CONTU (National Commission of New Technological Uses of Copyrighted Works), which in 1978 concluded that the best form of protection for software would have been the copyright. The position of the Court was confirmed the same year, in *Parker v. Flook*\(^{12}\), based on the same principle. As the Court itself would have remembered later:

“The claims were drawn to a method for computing an *alarm limit*. An *alarm limit* is simply a number, and the Court concluded that the application sought to protect a formula for computing this number. Using this formula, the updated alarm limit could be calculated if several other variables were known. The application, however, did not purport to explain how these other variables were to be determined, nor did it purport to contain any disclosure relating to the chemical processes at work, the monitoring of process variables, or the means of setting off an alarm or adjusting an alarm system. All that it provides is a formula for computing an updated alarm limit\(^{13}\).”

The Court explicitly held that “a process is not unpatentable simply because it contains a law of nature or a mathematical algorithm”\(^{14}\). In this case the algorithm was merely applied to the chemical process, without any further inventive.

The narrowness of the decision was noted by some observers. Goetz himself stated that “none of the computer programs that came before the Supreme Court is regarded by the software industry as a good example of

\(^{12}\) 437 U.S. 584 (1978)
\(^{13}\) 450 U.S. 186, 187 (1981)
\(^{14}\) 437 U.S. 190 (1978)
high-level programming\textsuperscript{15}. However, few years later, the Congress approved CONTU’s copyright policy, by voting the \textit{1980 Amendment of the Copyright Act}.

It is therefore clear that during the 70’s the question of software patentability did not come to a solution, and the most common form of protection was trade secret. At that early stage of the evolution of the industry, the majority of the programs were \textit{taylor-made}, with detailed license agreements between customers and developers, as opposed to \textit{general purpose} software that was introduced only with the introduction of PCs\textsuperscript{16}.

\textbf{2.1.3 - The 80’s and the PCs}

Year 1981 is a significant turning point for software industry, with the introduction of IBM’s first personal computer\textsuperscript{17}. From that point, the computer market had a rapid development, and IBM’s PC faced the competition of several other machines in few years\textsuperscript{18}. The proliferation of clones fostered the competition for a standard to be used on those machines\textsuperscript{19}. It is during those years that Microsoft introduced its operative system MS-DOS\textsuperscript{20}. As shown by Stobbs\textsuperscript{21}, Microsoft (together with Adobe) has been

\begin{thebibliography}{9}
\bibitem{16} R. Pardolesi, M. Granieri, \textit{Il software}, at 3.
\bibitem{18} Andrew Pollack, \textit{Big I.B.M. Has Done It Again}, N.Y. Times, Mar. 27, 1983.
\bibitem{20} Andrew Pollack, \textit{Microsoft Has It All-Almost}, N.Y. Times, Sept. 4, 1985.
\bibitem{21} Gregory A. Stobbs, \textit{Software Patents}, § 11.01[B]
\end{thebibliography}
one of the first software firms to invest heavily in patents in order to preserve its key assets. Other than operative systems, the PC prompted a need for sophisticated software applications, thus creating a vast market in which a large number of firms started to compete, in order to attract the limited capital investors. The market scenario at this point had clearly changed. Software firms, more than ever before, sought protection for their intellectual assets, therefore the strong need to clarify which form of protection was the most adequate for software.

It is during the same year when PCs came to market that, in *Diamond v. Diehr*, the Supreme Court first opened the way to software patents. In *Benson*, the dividing line between what was patentable subject matter relied on the concept of algorithm, intended as a procedure to solve a given mathematical problem. In the judgement, the Court underlined how “phenomena of nature, * * * mental processes, and abstract intellectual concepts are not patentable,” and therefore the algorithm (itself) cannot be granted a patent. Therefore, in order to overcome the former judgement, the Court adds another conceptual layer by reasoning in terms of application of the algorithm, thus introducing the criteria of the *performing function*:

“[the respondents here] do not seek to preempt the use of that equation. Rather, they seek only to foreclose from others the use of that equation in conjunction with all of the other steps in their claimed process.”

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26 437 U.S. 584 (1978).
This new stance towards software patenting has been consolidated from the Court of Appeals for the Federal Circuit\(^{27}\) (CAFC). This Court was intended to “increase doctrinal stability in the field of patent law\(^{28}\)”, and in fact it had an active role in strengthening the path opened from the Supreme Court\(^{29}\). Significantly, it is the same CAFC that, later in *In re Alappat*\(^{30}\), finally made explicit that “a computer operating pursuant to software may represent patentable subject matter\(^{31}\)”. Within the same judgement, the Court further stressed on an extensive interpretation of Title 35, Section 101, evidencing how, with the word “any”, the Congress intended not to place any restrictions on the subject matter for which a patent may be obtained\(^{32}\).

Despite the new criteria introduced by the Supreme Court, most of the firms during the 80’s did not seek patent protection, following CONTU’s suggestion of relying on copyright instead. Despite Diher, the legal background for software patenting was still considered uncertain by the majority. For example, Donald Chisum argued that an explicit overruling of Benson was necessary in order to clear the way for software patenting\(^{33}\), while Samuelson argued that the PTO was excessively tolerant towards software pat-
Until the end of the 80’s, only Microsoft and Apple had seen patents to be fundamental assets to their businesses. The former did so in order to protect its MS-DOS, the latter in order to keep its lead in the so-called “Font Wars.”

2.1.4 - The 90’s and the proliferation of patents

It is during the 90’s that software patents started to proliferate. The Lotus case had shown the problems with copyright. The PCs reached the mass market, and the software industry inevitably followed. The CAFC and the Supreme Court were supportive and in 1994 software became explicitly patentable subject matter.

Allison, Dunn and Mann show how, from 1990 to 2001, patents per $bln of sales and R&D expenditure increased of 300-500% (see Figures 1 and 2), especially within the prepackaged software firms and system design.

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37 Lotus Dev. Corp. v. Borland Int'l, Inc., 49 F.3d 807 (1st Cir. 1995), and Lotus Development Corporation v. Borland International, Inc., 516 U.S. 233 (1996). Lotus sued Borland for copyright infringement, claiming that the structure of the menus in Borland’s software “Quattro Pro” was identical to the one implemented in “Lotus 1-2-3”. The Federal Circuit Court and the Supreme Court ruled in favor of Borland, holding that the menu hierarchy is to be considered a “method of operation” and is not therefore copyrightable. The CAFC used as a metaphor the buttons of a VCR: “that the buttons are arranged and labeled does not make them a literary work” nor does it make them an “expression” of the abstract “method of operating”.

firms. The electronics industry had shown a rather modest increase, having experienced stable patenting practices in the former years.

From the figures it is therefore evident that during the early 90’s there was a sharp increase in the propensity of the industry to seek patent protection for software. What emerges is that, while firms during the 80’s wanted to patent their fundamental technologies, during the 90’s software firms start...
to patent as a matter of routine, seeking protection as well for non-core technologies that had not been marketed yet\(^{39}\).

Another important step in software protection, this time with respect to copyright, is the *Digital Millennium Copyright Act* (1998), that:

1. criminalizes production and dissemination of technology, devices, or services allowing to overcome those measures that control access to copyrighted materials, also known as Digital Rights Management;
2. criminalizes the act itself of circumventing an access control, regardless of whether or not a copyright is in fact infringed;
3. makes the penalties for copyright infringement stricter for the Internet user, exempting providers from liability.

The same year (1998), in *State Street Bank & Trust Co. v. Signature Financial Group*\(^{40}\), the CAFC held that algorithms are patentable “even if the useful result is expressed in numbers, such as price, profit, percentage, cost, or loss”, without anymore relying on physical elements or process steps, as long as they produce “useful, concrete and tangible” results\(^{41}\). This reasoning has a sharp impact on with respect to business method patenting. However, the Amazon’s one-click patent was awarded well before *State Street*. In 2008, *In re Bilski*\(^{42}\) questioned the test in *State Street*, rejecting a patent claim for a business method for a broker to hedge risks in commodities trad-

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\(^{40}\) 149 F.3d 1368 (Fed. Cir. 1998).


\(^{42}\) 545 F.3d 943 (Fed. Cir. 2008).
The Supreme Court granted certiorari on June 2009, and will hopefully clarify the extent to which business methods are patentable.

2.1.5 - End 90′s: software and business models

The evolution of software industry had constantly faced the challenge to seek adequate IP protection, or rather, valid criterium to apply existent law to such a complicated object. As previously shown, software is often protected with a mixed IP strategy, employing copyright, trademark and patents. Copyright had shown its limits, being intended to protect the expression of ideas, and thus the mere copying.

Instead, the extent to which processes and algorithms are patentable is not clear yet. The patentability of the implementation of a mathematical formula has been bound to the concept of performing function, which is to say to the utility. But such requirement of utility is, among the three provided by Title 35 Section 101, U.S. Code (novelty, utility, non-obviousness) the most vague, and less likely to stop the proliferation of patents.

With its extensive interpretation of what can be patentable subject matter, unbound the performing function from physical aspects, the Court in fact opened the path to business method patenting. It is clear that those methods are useful to the applicants. The risk here is that patents are granted

to software that is mere implementation of already well-known mental processes and procedures.

In the next paragraph I am going to present the most well-known example of business method patent applied to software: the one-click Amazon patent.

2.2 - Business models and Amazon’s one-click patent

Amazon.com is today the most known website for online retailing. It was launched by its actual President, CEO and Chairman Jeff Bezos in 1995. A former online bookstore, it has today diversified its product portfolio to CDs, DVDs, Mp3s, software, electronics, apparel, food and more. The case for its one-click patent has been highly debated and it is rather explicative of the issues arising from software patenting.

2.2.1 - Basic facts: the lawsuit against Barnes & Noble

In 1999 the USPTO issued Patent #5,960,411 for “Method and system for placing a purchase order via a communications network”, commonly known as “one-click patent”. The patent describes a system allowing online customers to enter their information (name, credit card number, address information) just once, so that for following orders on the same website a single mouse-click was sufficient to make a purchase. As further explained by Tim O’Reilly47: “The idea is that your command in a web browser to buy a certain item can carry along information about your identity. (It works by

47 http://www.gnu.org/philosophy/amazon.html
sending the server a “cookie”, a kind of ID code that your browser received previously from the same server.)”

Not even a month after the patent was issued, Amazon filed a patent infringement lawsuit against its competitor Barnes & Noble, which was offering its “Express lane” service, a one-click ordering system. Amazon claimed that this system infringed its one-click patent.

The utility of the one-click method with respect to traditional “Virtual shopping Cart” is that customers do not have to “check out” their cart. Industry studies show that, at the time of the Amazon case, 60-65% percent of online shoppers abandoned their shopping cart before checking out. The primary reason seemed to be buyer confusion and annoyance with the online purchasing process. Therefore, by adopting a one-click method for online purchase and permitting their customers to skip the whole shopping cart process, Amazon and Barnes & Noble made the process simpler and faster, resulting in a clear advantage\(^48\).

Seattle’s Court issued a preliminary injunction against Barnes & Noble, founding evidence that the patent had been infringed with respect to claim 1. In the injunction, the judge specified that:

“The evidence indicates that Barnesandnoble.com can modify its 'Express Lane' feature with relative ease. For instance, infringement can be avoided by simply requiring users to take an additional action to confirm orders.”\(^49\) And in fact, Barnes & Noble required shoppers to perform a second click in order to confirm the order, thus designing around the first claim of Amazon’s patent.


The Federal Circuit Court of Appeals in Washington, D.C. lifted the preliminary injunction more than one year later\(^{50}\), by raising "substantial questions as to the validity" of the patent\(^{51}\). The court in fact had found “key limitations of the claims of the patent in suit” which, at trial, were likely to be found sufficient to make invalid the patent for obviousness to a person skilled in the art. Finally, the lawsuit was privately settled in 2002. The terms of the settlement had not been disclosed, and therefore we don’t know whether or not Barnes & Noble paid royalties to Amazon for such patent. It is instead known that Apple was the first licensee to Amazon’s one-click technology, to utilize in its Apple Online store, iTunes and iPhoto\(^{52}\).

### 2.2.2 - The reaction of the open source community and the boycott

The case led to several criticisms\(^{53}\), especially from the Open source community. One of its higher representatives, Richard Stallman, a developer and programmer who heads the GNU Project - Free Software Foundation did not approve the patent because of the restrictions it placed on online commerce. The 22\(^{nd}\) of December 1999 he proposed a boycott of Amazon, in an online article in Linuxtody. He argued that "if this were just a dispute between two companies, it would not be an important public issue." but, he

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held, Amazon's patent suit is "an attack against the World Wide Web and against E-commerce in general." 54"

It is worth noticing that Paul-Barton Davys, one of Amazon’s founding programmers agrees with Stallman. He declared that Amazon.com had "benefited enormously from the wealth of ideas circulating in the open and/or free software world of the middle 1990's. * * * Amazon.com's early development relied on the use of tools that could not have been developed if other companies and individuals had taken the same approach to technological innovation that the company is now following." He finally labels the one-click patent "a cynical and ungrateful use of an extremely obvious technology." 55"

Journalist James Gleick within its *Patently Absurdly* article, held the strong opinion that “once the province of a nuts-and-bolts world, patents are now being applied to thoughts and ideas in cyberspace. It is a ridiculous phenomenon, and it could kill e-commerce.” 56"

On the other hand, in his conversation with technology writer Tim O'Reilly, Jeff Bezos (Amazon founder) admits that one-click purchasing is trivial to duplicate. In the conversation, he explains that “what makes this patent viable has nothing to do with the implementation, but with its refram-


55 His statement of disagreement can still be found at his website, http://www.equalarea.com/paul/amazon-1click.html


ing of the purchasing problem”. When Bezos came up with his solution, the shopping cart was in fact the common practice, and he therefore argued that “small inventions can often seem extremely obvious in retrospect. The patent literature is full of this kind of thing. The significance of an invention isn't how hard it is to copy, but how it reframes the problem in a new way”.

Yet, the legitimacy of patenting such a simple process is strongly questionable. With respect to novelty requirement, it is still unclear as to whether Amazon was indeed the first to do implement such a purchasing process. But what is also hard to believe is the extent of inventive that was needed to actually come up with the one-click purchase system. If Amazon hadn't done it first, would others have come up with it just as easily on their own?58. In other words: was such an invention to be considered obvious?

2.2.3 - A deeper analysis of the case

Taking a closer look to the ‘411 patent, it is worth noticing how it is stressed, in each of the four independent claims, how a single action is to be performed to place the order, as (explicitly) opposed to “the shopping cart ordering model”59. The flow chart shows the basic mechanism of the purchase process, as shown in Figure 3. The Defendants actually claimed the ‘411 (one-click) patent to be invalid on obviousness and anticipation grounds. In order to support their arguments, they offered evidence supporting several prior art references60. Said evidence of prior art was classified by


59 U.S. Patent 5,960,411, page 1, line 35, 35.

Figure 3

Patent #5,960,411 for “Method and system for placing a purchase order via a communications network”, drawing sheet 5 of 11, at 7.
the Court in two categories: “systems for ordering tangible items online” such as the Web Basket system. The second category was “electronic document delivery systems”, which included the Netscape Merchant System, the CompuServe financial information service “Trend” feature and the ‘780 Patent\(^6\). It is with respect to these “document delivery systems” that Barnes & Noble claimed that the idea of the single-action order was within the scope of the prior art. Nevertheless, the Court found that (despite some references to the possibility of a single-action order in the above listed systems) none of the said delivery systems provided a process in which a single action was needed to place an order. Therefore, the combination of a single-action delivery system with the Web Basket, resulting in Amazon’s one-click feature and Barnes & Noble’s “Express Lane” feature, was not to be considered an obvious combination. In coming to such a decision, the Seattle’s Court took into consideration Dr. Lockwood's (the Web Basket model inventor) admission that he personally never thought of combining or modifying the prior art to come up with the claimed “single action” invention. It is worth noticing that it was however “undisputed that these prior art references were not before the PTO when the ‘411 patent was examined”\(^6\).

More than one year later, the Federal Circuit Court of Appeals\(^6\) held instead that substantial questions had been raised with respect to the validity of the ‘411 patent in front of the prior art evidences brought by the Defendants. The CAFC remembered that, as a matter of law, “whatever Dr. Lockwood did or did not personally realize at the time based on his actual

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knowledge is irrelevant. The relevant inquiry is what a hypothetical *ordinarily skilled artisan* would have gleaned from the cited references at the time that the patent application leading to the '411 patent was filed”.

The CAFC held that the references to the suggestion of a single-action purchase present some of prior art findings\(^\text{\textsuperscript{64}}\) (although not implemented in a process), combined with references to prior art that already included a user

\(^\text{64}\) BN also presented as a prior art reference an excerpt from a book written by Magdalena Yesil entitled Creating the Virtual Store that was copyrighted in 1996.* * * BN focuses on the following passage from Appendix F of the book:

Instant Buy Option: merchants also can provide shoppers with an Instant Buy button for some or all items, enabling them to skip check out review. This provides added appeal for customers who already know the single item they want to purchase during their shopping excursion.

The district court dismissed the significance of this passage, stating that "[r]ead in context, the few lines relied on by Defendants appear to describe only the elimination of the check-out review step, leaving at least two other required steps to complete a purchase.” However, the district court failed to recognize that a reasonable jury could find that this passage provides a motivation to modify shopping cart ordering software to skip unnecessary steps. Thus, we find that this passage, viewed in light of the rest of the reference and the other prior art references cited by BN, raises a substantial question of validity with respect to the asserted claims of the '411 patent.
identification\textsuperscript{65} method, “provided enough motivation to modify a shopping
cart to implement “single-click” orderings as claimed in the ‘411 patent.”

The court therefore lifted the preliminary injunction and found, as previ-
ously introduced, “substantial questions as to the validity” of the patent\textsuperscript{66}. The patent was not invalidated, as “vulnerability is the issue at the prelimi-
nary injunction stage, while validity is the issue at trial. The showing of a
substantial question as to invalidity thus requires less proof than the clear
and convincing showing necessary to establish invalidity itself”. And at that
point, the trial was privately settled.

\textbf{2.2.4 - Conclusions from the Amazon case}

It is clear how no issue had been raised by the Federal Circuit regarding
whether or not the subject matter falls or not within the scope of patentable

\textsuperscript{65} * * * despite the fact that Web-Basket is an embodiment of a shopping cart model, it is
undisputed that Web-Basket implemented the Internet Engineering Task Force ("IETF")
draft "cookie" specification, and stored a customer identifier in a cookie for use by a web
server to retrieve information from a database. In other words, when a user first visited the
Web-Basket site, a cookie (i.e., a file stored by the server system on the client system for
subsequent use) was used to store an identifier on the user's computer. The first time that a
user purchased an item on the Web-Basket site, the information entered by the user neces-
sary to complete the purchase (e.g., name, address) would be stored in a database on the
server system indexed by an identifier stored in the cookie on the client system. On subse-
quent visits, the cookie could be used to retrieve the user identifier, which would serve as
the key to retrieve the user's information from the database on the server system.

At the preliminary injunction stage, based on Dr. Lockwood's declaration and testimony
during the hearing, BN argued that the Web-Basket reference—combined with the knowl-
edge of one of ordinary skill in the art at the relevant time—renders obvious the claimed
invention. * * * Moreover, the district court did not address the "cookie" aspects of the
Web-Basket reference, and failed to recognize that a reasonable jury could find that the step
of storing purchaser data on the server system for subsequent retrieval indexed by an identi-
fier transmitted from the client system was anticipated and/or rendered obvious by the Web-
Basket reference.

F.3d 1343, Fed. Cir., February 14, 2001

subject matter. In fact, there was no mention that the subject matter was not statutory under 35 U.S.C. §101. This would confirm that the innate patentability of subject matter of this type is a non-issue, and that such subject matter should be treated as any other subject matter would be. In this sense, the Amazon case confirmed the patentability of software and business methods.

Beyond the analysis of the Federal Circuit Court, this case shows the flaws of the USPTO, that issued a patent whose substantial part of the claims (the automatic recognition of the customer, and the shopping chart model) felt within the scope of prior art. The utility of the invention is not questionable, although through this concept patents of questionable validity had been granted. As a result there are several patents issued, whose ability to succeed a trial or reexamination is fairly uncertain. Rivette and Kline show that a large percentage of patents on software technologies (estimates run as high as 50%) do not cite any prior art. Such patents are very likely to be found invalid on grounds of obviousness and anticipation if tested in court or reexamined by the USPTO.

The other question emerging from the case is, of course, obviousness, a point that we will find to be crucial, especially with respect to software. The Federal circuit held that some prior art suggesting the idea of the single-click was needed in order to claim the patent invalid. Curiously, 22 out of 26

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67 The effects of the “one-click” patent and reversal of the amazon.com decision: what does it mean for “business method” patents?, Published in the April 2001 issue of Intellectual Property Today.

claims of the ‘411 patent were invalidated due to the legal action in 2007 of Peter Calveley, a New Zealander with no business interest in Amazon. Calveley used internet archives to show how the one-click patent was for the most part not valid, on grounds of anticipation. He had found references to a so-called DigiCash payment method in which a click on a website payment link would trigger a server to send a payment request to the customer, which pre-dated Amazon’s patent. After the million dollar case, a $2,500 fee with evidence of prior art sufficed in order to prove the ‘411 patent mostly invalid.

It is however clear how the case left the key issue of obviousness untouched. The Federal Circuit argued that some prior art teaching, suggesting or motivating a combination of further prior art was needed in order to retain a claim obvious.

**2.3 - Obviousness: KSR v. Teleflex case**

In *KSR Int’l Co. v. Teleflex, Inc.* the U.S. Supreme Court addressed the issue of obviousness in patent claims. Although the case itself is not specifically software-related, it constitutes a very relevant precedent for future software patent litigations, especially considering the intrinsically contro-

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69 USPTO Examiner Office Action dated Oct 9, 2007 for reexamination serial number 90/007,946.


versial nature of software itself as patentable subject matter. The case it is actually cited by the USPTO Board of Patent Appeals and Interferences in about 60% of its decisions that are related to the criteria of obviousness. The question of obviousness is one of the most important and discussed question in patent law. Such a requirement is contained in § 103 Title 35 U.S.C., according to which a patent claim is to be considered invalid if it “would have been obvious at the time the invention was made to a person having ordinary skill in the art”. In 1966, the Supreme Court set a framework for applying § 103 in Graham v. John Deere Co., whose further Federal Circuit interpretation led to the creation of the TSM (teaching, suggestion, motivation) test. In KSR v. Teleflex, the Supreme Court rejected the Federal Circuit is rigid application of the test, fostering an obviousness approach with flexibility and common sense, in order to avoid “rigid preventative rules that deny factfinders recourse to common sense”.

2.3.1 - History of the case: the District Court judgement

The two firms are automobile-parts manufacturers. KSR had developed an adjustable pedal system for cars, with cable-actuated throttles, obtaining patent 6,151,976 (the ‘976 patent) for design. After that the patent was issued, General Motors Corporation chose KSR to supply adjustable pedal

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75 Similarly, article 56 of the European Patent Convention, requires an “inventive step”. “An invention shall be considered as involving an inventive step if, having regard to the state of the art, it is not obvious to a person skilled in the art.” (art. 56 EPC)


systems for trucks using computer controlled throttles. In order to make the ‘976 patent compatible with trucks, KSR added a modular sensor\(^{78}\) to its design\(^{79}\).

At the time of the original suit, Teleflex was the exclusive assignee of U.S. Patent 6,109,241 (the so-called “Engelgau” patent), which claimed a specific type of adjustable pedal assembly used in automobiles. In November 2006, Teleflex, Inc. sued KSR Int’l, claiming that KSR’s product infringed Engelgau’s patent claim 4, which disclosed “a position-adjustable pedal assembly with an electronic pedal position sensor attached to the support member of the pedal assembly,” which “allows the sensor to remain in a fixed position while the driver adjusts the pedal.”

The Defendants claimed that claim 4 of the Engelgau patent was an obvious combination of prior art. More specifically:

1) The Asano patent\(^{80}\), disclosing, as described by the District Court, “a support structure that houses the pedal so that even when the pedal location is adjusted relative to the driver, one of the pedal's pivot points stays fixed. The Asano pedal assembly also is designed so that no matter where the pedal sits within the footwell, the force required to depress it remains constant.”\(^{81}\)

2) The ‘068 Patent (U.S. Patent No. 5,385,068) providing a self-contained modular electronic sensor that is possible to attach to a tradi-

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\(^{78}\) Disclosed in U.S. Patent N. 5,385,068.


\(^{80}\) U.S. Patent No. 5,010,782 (filed July 28, 1999).

tional mechanical pedal assembly, in order to make it compatible with a computer-controlled throttle.

In formulating its judgement, the District Court applied the Graham factors:

(a) determining the scope and contents of the prior art;
(b) ascertaining the differences between the prior art and the claims in issue;
(c) resolving the level of ordinary skill in the pertinent art; and
(d) evaluating evidence of secondary consideration.

The District Court held the Engelgau patent to be a mere and predictable combination of the cited known elements, finding “little difference” between the prior art teachings and claim 4: “Asano taught everything contained in the claim, except using a sensor to detect pedal’s position and transmit it to a computer controlling the throttle. That additional aspect was revealed in the ‘068 patent.” The Court finally concluded that a person having ordinary skill in the art, with an undergraduate mechanical engineering degree (or an equivalent amount of industry experience) and “familiarity with various types of pedal control systems” would have come to such a solution.

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2.3.2 - The TSR Test and the Federal Circuit reversal

In overruling the District Court judgement, the Federal Circuit applied the “teaching, suggestion, or motivation” (TSM) test. Under this test, a patent claim is proved obvious when prior art, the problem’s nature, or the knowledge of a person having ordinary skill in the art reveals some motivation or suggestion to combine the prior art teachings. The Federal Circuit argued that the District Court hadn’t applied the test strictly enough, thus failing in finding evidence of prior art that would have led a skilled artisan to combine the two pieces of knowledge, more specifically some references addressing the precise problem that the patentee sought to solve. The problem itself was not considered sufficient for an inventor to come up with such a combination of prior art, since the different pieces of prior art were intended to solve different problems, and therefore the problem itself wouldn’t have motivated an inventor to look at those specific references. The argument that the combination would have been “obvious to try” was, in the opinion of the Federal Circuit, irrelevant.

2.3.3 - The Supreme Court judgement

The Supreme Court held that such a narrow and rigid approach to the obviousness question was “inconsistent with §103 and [the] Court’s precedents84”, and that “KSR provided convincing evidence that mounting an available sensor on a fixed pivot point of the Asano pedal was a design step well within the grasp of a person of ordinary skill in the relevant art and that the benefit of doing so would be obvious” (emphasis added).

The Federal Circuit, according to the Supreme Court, made four fundamental errors:

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1. looking exclusively to the problem that the patentee was trying to solve, without considering that any problem in the field can be a reason for combining other pieces of prior art;
2. the assumption that a person of ordinary skill in the art, while solving a problem, would have considered exclusively those elements that were designed to solve the same exact problem;
3. concluding that a claim can not be proved obvious merely by showing that it was “obvious to try”;
4. emphasizing the risk of hindsight bias (TSM test) at the expense of common sense.

The first two errors relate to the intent of the inventor, which, while it can provide some useful hindsight, is irrelevant to the judgement, that ought look for what is objectively stated in the claims.

The third error relates more into deep to the issue of obviousness. As the Court stated, “when there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill in the art has good reason to pursue the known options within his or her technical grasp”. It is clear therefore that a combination of prior art findings does not need to be explicitly suggested from other prior art elements. Such a combination of familiar elements is likely to be obvious when it simply leads predictable results and nothing more. It would, in fact, be rather a “product not of innovation but of ordinary skill and common sense”.

With respect to the TSM test, the Court specified its consistency with Graham inquiry factors and moreover recognized that such a test captures

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an “helpful insight”. In fact, the finding that each element composing a patent was, independently, present in the prior art, does not itself make the combination obvious. An explicit analysis of the reasons, and possibly prior art teachings, that would lead to a combination of known elements, surely facilitates the review. Helpful insights should not, however, become “rigid and mandatory formulas”. When applied in such manner, the TSM test is to be considered not in line with the Court’s precedents.

2.3.4 - Scope of the Court’s judgement

Given the relevance of the case, Margaret Focarino (USPTO Deputy Commissioner for Patent Operations) issued a memorandum of the case86. In the memo summarizes how Graham’s four-factor test is reaffirmed, while keeping the CAFC's more structured TSM test as a “helpful insight”. Focarino in the last lines specifies very clearly that “in formulating a rejection under 35 U.S.C. 5 103(a) based upon a combination of prior art elements, it remains necessary to identify the reason why a person of ordinary skill in the art would have combined the prior art elements in the manner claimed87.”

With its unanimous decision, the Court substantially changed the role of TSM test, indicating to the Federal Circuit that it had been going too far with granting patent whose claims validity was in reasonable doubt. No


doubt that such a case weakens patent holders and limits new applicants. From the statements of the Court’s justices, the intention of the Court insubstantially reshaping the concept of obviousness is clear. Justice Antonin Scalia defined the test “three imponderable nouns”. Chief Justice John Roberts Jr. labeled it “Federal Circuit jargon” that is inflexible and “worse than meaningless.” And in fact, the test had long time been criticized as it made too hard for examiners to deny a patent application, as well for incumbent firms to overcome existing patents. Such a patent-friendly test had been accused of having caused the proliferation of junk patents, stifling competition. James Dabney, the lawyer who defended KSR, argued that such test made it “very difficult to challenge a patent claim, no matter how small might be the difference between a patent claim and prior art.”

2.3.5 - KSR and the problem of hindsight bias

Hindsight bias is defined as “the cognitive limitation arising from the fact that humans are unable to disregard ex post knowledge in determining the


ex ante probability of events they know to have happened. As the Supreme Court noted, “it may seem very plain to any one” once the invention occurred “that he could have done it as well.” The Court, in fact, recognized the issue of hindsight bias in obviousness inquiries since over a century, and further addressed it in KSR.

Nevertheless, a test able to solve the issue hasn’t been created. While objective rule (such as the TSM test) tends to be either over or under-inclusive, and to this respect, there is consensus that the TSM test led to patent over-issuance. While relying instead on a subjective rule, hindsight bias appears. In KSR, the Court opted for a subjective criteria, requesting judges to rely on their common-sense.

In patent decisions, hindsight bias plays a major role. First, in determining the knowledge level of a person with “ordinary skill in the art” at the time of the invention. Second, in determining whether or not said person would have came considered the claim obvious. Such hindsight bias effect


is more present when people are told that an event has occurred than when they are instead told that the event has not occurred\textsuperscript{100}. And therefore, since invention had necessarily occurred to be invented in order to be examined, such bias is likely to be exacerbated\textsuperscript{101}.

The inability of the Court to adequately address hindsight bias without coming to an over or under issuance problem\textsuperscript{102}, suggests that the solution could rather be found strengthening the administrative procedures at PTO level. The Patent Office possesses tools and expertise in order to address the question\textsuperscript{103}, suggesting a more structured reform of patent law.

\textbf{2.3.6 - Conclusions on KSR}

The full implication of the KSR case remain therefore unclear\textsuperscript{104}. No doubt KSR is a step forward in addressing obviousness, but the patent over-issuing problem requires a perhaps more structured reform of patent procedures\textsuperscript{105}. It is interesting to note how, in response to the argument, Goldstein (Teleflex lawyer) argued that by adding “significant new factors to the test, legal challenges to past patents could be a huge problem”, in fact suggesting

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that, to the extent of issued patents, the magnitude of *KSR v. Teleflex* perhaps remains to be seen\(^\text{106}\).

In such a scenario, it is likely that a significant number of actual patents are reasonably questionable with respect to the requirement of non-obviousness.

### 2.4 - First findings on software patenting issues

Thus far a complex scenario emerged. The legislative steps regarding software as patentable subject matter are far from linear and the debate concerning the opportunity and the extent of issuing such patents is certainly not over.

Jeff Bezos itself, in his open letter\(^\text{107}\), argued that “patent laws should recognize that business method and software patents are fundamentally different than other kinds of patents”, asking for software patents that last 3-5 years, and addresses as well the need for efficient prior art assessment.

*KSR* represents an important step with respect to patent litigation concerning the issue of obviousness. However, it doesn’t solve the question of hindsight bias in evaluating prior art, although its impact is still to be fully evaluated.

Therefore, software firms face a scenario with an ongoing debate on the selective criteria, and a demand for a structured reform of the administrative


procedures. In said scenario, the validity of issued patents is often questionable on anticipation and obviousness grounds, and there’s nevertheless an objective difficulty in retaining value from software patents\(^\text{108}\).

It is clear that the strictly legal aspect themselves tend - given the instability of the framework - to be relatively marginal with respect to market and strategic considerations.

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The multi-touch technology became popular in 2007, when Apple launched its iPhone\textsuperscript{109}. With such technology, it is possible to detect multiple fingers (or objects) on the tablet’s surface, and utilizing complex gestures that significantly add value to the product in terms of ease of use especially when the touch surface is very small as in a mobile phone.

Apple’s main competitors (HTC\textsuperscript{110}, Nokia\textsuperscript{111}, Samsung\textsuperscript{112}, HP\textsuperscript{113}) mainly utilize a traditional touch screen technology, that detects only one point on the screen. It is currently disputed whether or not such technology, applied to a mobile device, is owned by Cupertino’s firm\textsuperscript{114}. On Jan 20, 2009, U.S. Patent #7,479,949\textsuperscript{115} has been issued, claiming a method for “detecting one or more finger contacts with the touch screen display”. The day after the patent was awarded, Apple’s COO Tim Crook stated “we will not stand for having our IP ripped off, and we will use whatever weapons that we have at our disposal”\textsuperscript{116}. This has been said to be addressed to competitor Palm\textsuperscript{117},

\textsuperscript{109} See \url{http://www.apple.com/iphone/specs.html}

\textsuperscript{110} See \url{http://www.htc.com/}

\textsuperscript{111} See \url{http://www.nokia.com}

\textsuperscript{112} See \url{http://www.samsung.com}

\textsuperscript{113} See \url{http://www.hp.com}


\textsuperscript{116} Mark Hachman, \textit{Will Apple Sue Palm Over the Pre?}, PcMag Jan. 21, 2009, available at http://www.pcmag.com/article2/0,2817,2339344,00.asp

\textsuperscript{117} See \url{http://www.palm.com}
whose recently released smartphone “Pre”\textsuperscript{118} implements multi-touch technology and challenges Apple’s monopoly on such technology.

But Palm is not the only one questioning Apple’s IP. Taiwanese company Elan Microelectronics retains that Apple products, including its MacBook\textsuperscript{119} laptop, iPhone and iPod Touch\textsuperscript{120}, use technology that infringes on two of Elan’s patents\textsuperscript{121}, and thus sued Apple for infringement\textsuperscript{122}.

Does Apple have a grip on multi-touch? The scope of the present chapter is to understand to which extent can Apple claim exclusiveness on the such technology.

3.1 - Multi-touch: short history

The first touch screens started to be developed in the end of the 60’s by IBM and the University of Illinois. By 1971 a number of different techniques had been disclosed. They all were single-touch and none were pressure-sensitive. Its first implementation was in 1972, in the Plato computer system project.
In the 80’s, the multi-touch technology started to be commercialized. According to Microsoft researcher Bill Buxton\textsuperscript{123}, the first multi-touch screen was developed by Bob Boie (Bell Labs, Murray Hill NJ).

In 1991, Pierre Wellner published a paper on his “Digital Desk”\textsuperscript{124}. Such Digital Desk supported multi-finger and pinching motions. It clearly demonstrated multi-touch concepts such as two finger scaling and translation of graphical objects, introducing, among other things, the use of a pinching gesture\textsuperscript{125}. One year later, IBM & Bell South developed the Simon, arguably the world's first smart phone. While only a single-touch device, the Simon introduced a number of aspects that we are currently seeing in most of the touch-driven mobile devices.

The multi-touch technology was further developed by a number of companies and universities, such as Mitsubishi’s Diamond Touch project\textsuperscript{126}, Synaptics and Pilotfish’s “Onyx”\textsuperscript{127}, Brown University\textsuperscript{128}, Columbia University and Microsoft Research\textsuperscript{129} and many others\textsuperscript{130}.

\textsuperscript{123} See http://www.billbuxton.com/multitouchOverview.html


\textsuperscript{125} See demonstrating video http://video.google.com/videoplay?docid=5772530828816089246

\textsuperscript{126} Mitsubishi Research Labs, Cambridge MA see http://www.diamondspace.merl.com/

\textsuperscript{127} A software multi-touch mobile phone. See http://www.synaptics.com/onyx/


\textsuperscript{130} For an exhaustive list, see http://www.billbuxton.com/multitouchOverview.html.
3.2 - Apple’s multi-touch patent ‘949

3.2.1 - Introduction

U.S. Patent #7,479,949\textsuperscript{131} is the so-called “multi-touch patent”. When it was issued, the patent has raised some disputes, and has been claimed to be “Apple’s death grip” on multi-touch technology.

The patent includes 293 drawing sheets that in fact describe the graphical interface and the gestures of each and every application present on the iPhone. The claims are relatively few, just 20, among which only 3 are independent.

While looking at the main claims, we can note that considerable pieces of this patent do not deal with multi-touch as a whole, but rather on one very specific case, the iPhone.

More specifically, the three independent claims (1, 11 and 17) disclose respectively a computing device, a computer-implemented method and a computer readable storage, all of them capable of translating heuristics into a command, “wherein the one or more heuristics comprise:

(a) a \textit{vertical screen scrolling heuristic} for determining that the one or more finger contacts correspond to a one-dimensional vertical screen scrolling command rather than a two-dimensional screen translation command based on an angle of initial movement of a finger contact with respect to the touch screen display;

(b) a \textit{two-dimensional screen translation heuristic} for determining that the one or more finger contacts correspond to the two-dimensional screen translation command rather than the one-dimensional vertical screen scroll-

ing command based on the angle of initial movement of the finger contact with respect to the touch screen display;

(c) and a next item heuristic for determining that the one or more finger contacts correspond to a command to transition from displaying a respective item in a set of items to displaying a next item in the set of items.” (emphasis added).

All three of the above heuristics are disclosed in each independent claim, referring respectively as “a computing device”, “a computer-implemented method” or a “computer readable storage”. With the exception of point (a) that is itself more specific, the other two (b and c) could disclose a number of different gestures and are in fact very broad. In the description of the embodiments are specified a number of applications and specific gestures that fall within the scope of the above mentioned generic heuristics. Most of them do not require multiple fingers on the screen.

3.2.2 - A closer look at the heuristics within the independent claims

The first (a) point of claim 1 relates to the ability of the iPhone to lock the scroll of a document (or, say, web page) in one dimension (vertical or horizontal), based on the angle of the first movement of the finger, and it is indeed very specific. An example of it is in Figure 3 (at 3937), where the vertical scroll lock is applied to a web page in a browser application132. It is worth noting that in the drawing a specific angle (27°) from the vertical axis is specified.

132 U.S. Patent #7,479,949, Drawing Sheet 150 of 293, at 152.
Point (b) covers a scroll when one-dimensional locking does not occur, and the scrolling is, in fact, two-dimensional. Such scrolling is implemented, for example, while viewing images (see Figure 4, at 1626), web pages (see Figure 4, at 3939) or scrolling e-mail (3532).

It is worth noticing how, in Figure 4 (3939), shows how the finger has to move to an angle bigger than 27°, in order to not vertically lock the scroll, as in point (a).

Point (c) can include a wide set of gestures. Figure 4 (at 1616) exemplifies an application of point (c), i.e. a swipe gesture applied to an application displaying a set of pictures, in order to display the previous/next item. The same result can be achieved with a tap on the side of the screen (Figure 4 at 1620 and 1618). Moreover, in some embodiments, in response to detecting a horizontal swipe gesture (see Figure 6 at 3576) on a particular email message in a list of emails messages, a process for deleting the particular email message is initiated133.

3.2.3 - The sub-claims

The sub-claims further disclose specific gestures (i.e. swipe, twist) and applied to a frame (photo album, web page, e-mail...), and exemplified in very detail in the “description of embodiment section”. For example, dependent claim #7 specifically discloses a “computing device of claim 1, wherein, in one heuristic of the one or more heuristics, a contact comprising a simultaneous two-thumb twisting gesture corresponds to a 90 degree

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screen rotation command”, which is exemplified in Figure 4 (at 3941) and Figure 5 (at 4404).

Another interesting embodiment is disclosed in dependent claim 8, where “an N-finger translation gesture corresponds to a command to translate an entire page of content and an M-finger translation gesture corresponds to a command to translate content within a frame rather than translating the entire page of content that includes the frame” (emphasis added).

The claim refers to the use of the same gesture, with a different number of fingers, that shifts the frame where the command is executed. Figure 7 (at 4214) shows an implementation of this method in a web browser.

3.2.4 - Conclusions on the ‘949 patent

In the end, the patent does not patent multi-touch itself, but rather some specific implementation of touchscreen technology, although it is Apple’s interest to grab as much space as possible. It is worth noting that most of the gestures do not even require the use of multiple fingers on the screen. The scope of this patent seems to be mainly limited to the iPhone and few gestures implemented on the device, with a stronger reference to the one-dimensional scroll lock feature.

Apple’s patent portfolio is not by any means limited to this patent. In the next paragraph, I will analyze a few other significant patents with respect to multi-touch devices.

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135 And in fact, it is specified that the examples “do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.”
Figure 3

U.S. Patent #7,479,949, Drawing Sheet 150 of 293, at 152.
Figure 4

U.S. Patent #7,479,949, Drawing Sheet 34 of 293, at 36.

Figure 16A

U.S. Patent #7,479,949, Drawing Sheet 34 of 293, at 36.
Figure 5

Figure 6

U.S. Patent #7,479,949, Drawing Sheet 142 of 293, at 144.
Figure 7

U.S. Patent #7,479,949, Drawing Sheet 173 of 293, at 175.
3.3 - Apple and Fingerworks

An important step for Apple has been the acquisition of Fingerworks’ touchscreen technologies. Fingerworks was founded by two former Delaware University students, John Elias and Wayne Westerman, whose work is cited within the ‘949 patent. At the moment, the company is no longer running business, and Elias and Westerman are currently filing patents for Apple.

Among Westerman and Elias’s work, the most referenced piece of work is Patent #6,323,846, called “Method and apparatus for integrating manual input”, which discloses a method for acquiring hand input through the utilization of “proximity images” (see Figure 9).

3.3.1 - Fingerworks Patent ‘846

Patent ‘846 is very extensive and comprises XXX drawings and YYY Claims. In particular, claim 33 discloses:

A method for tracking and identifying hand contacts in a sequence of proximity images in order to support interpretation of hand configurations and activities related to typing, multiple degree-of-freedom manipulation via chords, and handwriting * * * [such method comprising]


137 See Westerman’s web page at http://www.ece.udel.edu/~westerma/About_Wayne.html

138 See Table 1 on citation analysis, and Westerman’s profile.


segmenting each proximity image into groups of electrodes which indicate significant proximity, each group representing proximity of a distinguishable hand part or other touch device; *** computing velocity and filtered position vectors along each path *** and estimates of hand and finger positions”.

Another claim discloses “a method of computing hand and finger position offsets from the measured positions of individual hand contacts on a multi-touch surface ***, the method comprising the steps of:

establishing fingertip, thumb, or palm identities for each contact;

establishing an offset weighting for each contact;

computing a hand position offset, wherein the offset is a weighted average of the difference between a measured position of each contact and a predetermined default position of the hand part *** and computing a finger position offset, by subtracting a predetermined default position of an associated hand part *** from a measured position of the contact.” (emphasis added)

Figure 10 gives a better understanding of how proximity images work in multiple hand and finger tracking. The content of the patent basically revolves around Westerman’s PhD dissertation\(^{141}\) (whose professor in charge was John Elias), which addresses very in detail the formation of proximity images, then the segmentation of hand contacts, in order to track the path of the (estimated) position of fingers. This patent is in fact specific and fundamental to Apple, being cited in 72 other patents, among which 35 are filed

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under main Class 345/173\textsuperscript{142}. Among those 35 patents, only 8 have been assigned to Apple. Therefore, this patent seems to be the base for Apple’s multi-touch technology, but not only.

\textsuperscript{142} US Class 345/173

Class 345 “provides for processes and apparatus for selective electrical control of two or more light-generating or light-controlling display elements in accordance with a received or stored image data signal. * * * This class also provides for digital data processing systems or methods for data processing for visual presentation, wherein the processing of data includes the creation or manipulation of graphic objects (e.g., artificial images), or text.”

Subclass 173 is intended under subclass 156, where a “selective electrical control includes means which permits an operator to selectively control a display device.”

Subclass 173 is specific to touch panel displays, wherein the “peripheral input device includes a planar touch sensor which determines the position of a touch.”

For details, see \url{http://www.uspto.gov/web/patents/classification/uspc345/sched345.htm}. 

### 3.4 - Apple’s patent portfolio: a quick glance

#### 3.4.1 - US. Patent #7,469,381

US Patent #7,469,381\(^{143}\) is another iPhone-related patent that discloses a method for transitioning between different screen displays. Once a swipe

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gesture is identified “an electronic document displayed on the touch screen display is translated in a first direction”. If an edge of the electronic document is reached while doing so (while the object/finger is still detected on or near the touch screen display), an area beyond the edge of the document is displayed. After the object/finger is no longer detected, “the document is translated in a second direction until the area beyond the edge of the document is no longer displayed.”

This feature is indeed specific to when the “area beyond the edge of the document” is displayed. Figure 8 shows this feature implemented in a e-mail application. This feature, as we will see later on, has been implemented on Palm’s Pre.


145 A video can be found at http://www.viddler.com/explore/engadget/videos/221/0
Figure 8

US Patent #7,469,381, Drawing Sheet 8 of 38, at 10.
3.4.2 - Patent #7,339,580: cut, copy and paste gestures

Another implementation of such technology is patent #7,339,580\textsuperscript{146}, which discloses the cut, copy and paste gestures implemented on the iPhone. Both Westerman and Elias figure among the inventors. The patent claims a method “generating a cut command in response to a pinching motion between a thumb and a fingertip”. A copy command is instead generated “in response to a synchronized tap of a thumb and a fingertip detected on the multi-touch-sensitive surface”. And finally, a paste command is generated “in response to a movement of the thumb and a fingertip away from each other”. Those gestures are very distinctive, and currently only implemented on Apple devices.

3.4.3 - Citation analysis on Apple’s main patents

In order to understand the relevance of Apple’s patent portfolio, it is useful to perform a citation analysis, with particular reference to US Class 345/
and US Class 715/702, that specifically refer to touch panels. Other patents referring to touch sensors that were not relevant to multi-touch technology have been excluded from such table.

It is worth noting how Apple’s main piece of IP, patent ‘846, has over 40 references that fall within the interested Patent Classes. Among those, only 8 of those were assigned to Apple, suggesting that the patent had been held a valuable innovative step from other subjects.

3.5 - First evidences from Apple’s patent portfolio

From this first analysis, evidence points that Apple does not have a patent on multi-touch technology itself, being the idea of detecting multiple objects on a capacitive surface nothing new (and perhaps too vague to patent itself).

147 345/173 - Touch panel:
This subclass is indented under subclass 156. Subject matter wherein the peripheral input device includes a planar touch sensor which determines the position of a touch.

See also supra note 142.

148 715/702 - Tactile based interaction:
This subclass is indented under subclass 700. Subject matter wherein there is tactile as well as visual interaction between a user and an operator interface (i.e., vibration).

149 For example, patents #7,046,230 and #7,348,967 refer to the touch surface on traditional iPod, that do not have a touch screen.
Apple can rather claim exclusiveness on some rather specific implementation of multi-touch technology, meaning some specific features (vertical scroll lock, document edge showing) and gestures (cut, copy, paste), other than the patents assigned to Fingerworks disclosing the fundamentals (i.e. proximity images, chord manipulation). Among those, patent #6,323,846 is the most important within Apple’s IP portfolio. The extent to which those patents can be effectively enforced is still uncertain. The frame is rather complicated: extensive prior art, and nevertheless the risk of obviousness. Is the implementation of a gesture a sufficient inventive step, given the rather extensive prior art?

What we know so far, is that some significant challenge Apple’s IP is about to come from Elan and Palm.
3.6 - Elan vs Apple

Elan Microelectronics Corporation is an integrated circuit design company, founded in 1994 and headquartered in Taiwan. Despite the initial statement of non-conflict Elan filed a suit for infringement of two patents: 5,825,352 and 7,274,353, in conflict with Apple’s products iPhone, Macbook and iPod Touch.

3.6.1 - Elan’s ‘352 patent

U.S. Patent #5,825,352 discloses a “Multiple fingers contact sensing method for emulating mouse buttons and mouse operations on a touch sensor pad”. It is classified under U.S. Patent Class 345/173, as well as Apple’s patents related to multi-touch.

150 See http://www.emc.com.tw/eng/
151 See http://www.emc.com.tw/eng/news_1_1.asp?id=70
156 345/173 - Touch panel:
This subclass is indented under subclass 156. Subject matter wherein the peripheral input device includes a planar touch sensor which determines the position of a touch.

See supra note 142.
Such method is to be implemented on “any conventional touch sensing technology”\textsuperscript{157}. The method basically detects a number of objects (typically fingers) on the touch pad, based on peaks and minimums on the X and Y profile. The process (claim 1) involves scanning the touch sensor to identify sequence of minima and the maxima corresponding to the fingers, in order to provide indication of the simultaneous presence of the multiple fingers. Claim 2 discloses a point-and-click action, exemplified in Figure 11, while claim 3 disclose a “drag” function to “occur in response to the detection of at least a second maxima”. A “drag function” is as well disclosed in claim 11, “in response to detecting a movement in substantial unison of two said fingers”. In the patent, a number of implementation of multiple fingers actions is exemplified through the sheets. Figure 12 exemplifies a page scroll, obtained in response to the movement of three aligned fingers.

Apple’s products (Macbook’s touchpad\textsuperscript{158}, iPhone and iPod Touch\textsuperscript{159}) do implement said “drag” behavior (as in claim 11) as a response to a two-finger drag movement, and apparently fall within the scope of said patent.

The ‘352 patent, as shown in Table 1, counts 72 references. Among those, 35 fall within Class 345/173, and 5 of them are assigned to Apple (among which the ‘580 patent for cut, copy and paste gestures). In design patent RE40153, the ‘352 is cited in the “relevant prior art”: “U.S. Pat. No. 5,825,352 to Bisset et al. [and later bought by Elan] describes a touchpad with row and column electrodes that produces pointing in response to single finger motion and dragging in response to two finger motion”. Given the

\textsuperscript{157} U.S. Patent #5,825,352, “Multiple fingers contact sensing method for emulating mouse buttons and mouse operations on a touch sensor pad”, filed Feb. 28, 1996, originally assigned to Logitech, Inc., at 2, line 22.

\textsuperscript{158} See http://www.apple.com/macbook/specs.html

\textsuperscript{159} See http://www.apple.com/ipodtouch/specs.html
evidence so far collected, this patent appears to be a relevant piece of prior art with respect to multi-touch technology.

Figure 11

U.S. Patent #5,825,352, “Multiple fingers contact sensing method for emulating mouse buttons and mouse operations on a touch sensor pad”, at 9, drawing sheet #8.
3.6.2 - Elan’s ‘353 patent

U.S. Patent #7,274,353, “Capacitive touchpad integrated with key and handwriting functions”. In such touch panel, a number of re-
regions are defined, to be used for the diverse operations modes, such handwriting, keyboard and mouse. The abstract states:

“In the key mode, the key patterns among the printed patterns simulate a keyboard. In the handwriting mode, the handwriting region among the defined regions serves to handwriting input. In the mouse mode, the defined regions provide a cursor moving region and a horizontal and vertical scroll bars for input operations.” Figure 13 clearly illustrates the scope of the invention.

Moreover, claim 4 specifically discloses “a mobile telephone characterized in a capacitive touchpad * * * including: a panel for touch inputing, a first [region] for representing a mode switch to switch [said touchpad] between a key mode and a handwriting mode”.

Figure 13


The iPhone apparently falls within the scope of the ‘353 patent. What is at least in doubt is whether or not this patent possesses the inventive step to
stand out of the prior art. Was, in 2003, the possibility of switching from a key mode to handwriting mode a substantial step towards innovation, given the prior art at that time? Does such a “mode switch” possess the necessary inventive step? And is the division of the screen in regions (such as scroll bar) non-obvious with respect to (for example) the scroll bars in Windows’ standard graphical interface?

With respect to claim 4, a mobile phone characterized in a capacitive touchpad already existed more than 10 years before the ‘353 patent. According to Bill Buxton’s multi-touch history161, IBM had already commercialized a touch-screen based mobile telephone in 1992, namely the “Simon”162, in which, in fact, the screen was divided in regions, each one having assigned a function. The combination of this with a function to switch from handwriting to key mode appears not to add substantial inventive step. This hypothesis is reinforced by the fact that the ‘353 patent hasn’t been referenced by any patent yet, although the relatively recent issue of the patent (Sep 25, 2007) requires us to be very prudent while assessing the weigh of the ‘353.

161 See http://www.billbuxton.com/multitouchOverview.html

162 See http://findarticles.com/p/articles/mi_m3457/is_n14_v12/ai_14973288/
3.6.3 - Conclusions on Elan case

Elan seems to possess sufficient grounds to support its lawsuit, especially with reference to the drag function disclosed in patent ‘352, a recognized piece of prior art. Apple’s technology is mainly based on Fingerwork’s proxy images and vectors, while Elan’s ‘352 is based on a touch surface that recognizes two profiles (X and Y). The behavior, and the result desired (the two finger drag gesture) are nevertheless the same, and a trial could result in an injunction preventing Apple from selling products that embodies such technology, bearing an extremely high risk. Therefore, a private license settlement is very likely to happen in this case.
3.7 - Palm vs Apple

Another interesting case regarding Apple’s multi-touch related IP is Palm’s upcoming smartphone, the “Pre”\(^1\), whose “look & feel” is very similar to the iPhone’s. The product had been presented CES 2009\(^2\) in Las Vegas\(^3\), looking extremely similar to the iPhone\(^4\) in a number of behaviors. Tim Cook, Apple’s COO, had stated\(^5\) that “like competition, as long as they don't rip off our IP, and if they do, we are going to go after anybody that does.” This has been interpreted to be explicitly referred to Palm Pre, although when specifically asked, Cook replied he was “just making a general statement”. He continued that “we will not stand for having our IP ripped off and we will use whatever weapons we have at our disposal. I don't know that I can be more clear than that.”

An extensive analysis of Palm’s patent portfolio in potential conflict with Apple is not the scope of the present dissertation. Nevertheless, it is worth investigating whether or not, Apple or Palm do possess at least the beginnings of a claim against each other.

\(^2\) Consumer Electronics Show, see [http://www.ces-show.com/](http://www.ces-show.com/)
\(^3\) See [http://www.pcmag.com/article2/0,2817,2338482,00.asp](http://www.pcmag.com/article2/0,2817,2338482,00.asp)
\(^4\) The whole video of the presentation can be found at [http://www.viddler.com/explore/engadget/videos/166/](http://www.viddler.com/explore/engadget/videos/166/)
\(^5\) Mark Hachman, *Will Apple Sue Palm Over the Pre?*, PC Mag, Jan. 21, 2009, available at [http://www.pcmag.com/article2/0,2817,2339344,00.asp](http://www.pcmag.com/article2/0,2817,2339344,00.asp)
3.7.1 - Palm’s Pre behavior in conflict

The Pre does implement the behavior disclosed in US Patent #7,469,381\(^{168}\). Such behavior (formerly discussed in paragraph 3.4) consists of scrolling to the end of a document, revealing the edge of said document, and then "springing back"\(^{169}\). It would not be easy for Palm to claim that their smartphone is not infringing on this feature, since the iPhone behavior appears to be precisely reproduced.

Another Apple behavior\(^ {170}\) that is very likely to be reproduced on the Pre is the mono-dimensional scroll lock, disclosed in US Patent #7,479,949\(^ {171}\) and formerly discussed in paragraph 3.2. Apparently the Pre implements this behavior\(^ {172}\). It is not clear the extent to which this is conflicting with the ‘949 patent, since it is not known whether this behavior has been obtained utilizing the method disclosed by Apple, which is based on an initial angle of movement.

Chances are that Cupertino’s firm does possess the grounds for at least the beginning of a lawsuit against Palm.

3.7.2 - Patent #7,268,775 for adjustable brightness and dial pad

Palm is not the only one being in potential conflict. Being in the industry since 1992, Palm has a respectable number of patents, with whom Apple’s

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iPhone is likely to conflict with. Palm-owned US Patent #7,268,775\textsuperscript{173} discloses a “portable computer system that comprises adjustable brightness settings and brightness control * * * that can change the brightness range settings in response to a change in ambient light conditions.” Moreover, the user can also control the brightness of the display. The time required to implement a brightness change can be set to a value which can be configured by the user.” This feature is entirely implemented\textsuperscript{174} on the iPhone.

3.7.3 - Patent #7,007,239 for dial pad and contact list search

Another Palm’s patent is #7,007,239\textsuperscript{175}, in which a “Method and apparatus for accessing a contacts database and telephone services” is disclosed. Said patent claims “a method for selecting a desired subset from a list of names in a computer system * * * comprising: accepting a first desired letter input; selecting a first subset from said list of names comprising names having a first name beginning with said first desired letter; accepting a second desired letter input; and selecting a second subset from said first subset that have a first name beginning with said first desired letter and a last name beginning with said second desired letter”. In other words, it claims retrieving contacts by just typing in their name’s initials. The iPhone, as shown in Figure 15, does implement said feature.

Figure 15

\textsuperscript{173} US Patent #7,268,775, “Dynamic brightness range for portable computer displays based on ambient conditions”, filed May 25, 2005


\textsuperscript{175} US Patent #7,007,239 “Method and apparatus for accessing a contacts database and telephone services”, filed Feb. 28, 2006.
Moreover, claim 10 of the same patent describes the iPhone's dial pad:

![Figure 15](image.png)

Picture credits: [www.engadget.com](http://www.engadget.com)
“* * *displaying a first button for selecting a *telephone dial pad* interface for dialing a telephone number;

displaying a second button for selecting a *speed dial* interface for dialing a telephone number from a list of speed dial numbers;

displaying a third button for selecting *call history* interface for dialing a telephone number from a call history list;

displaying a fourth button for selecting a *contact list* interface for dialing a telephone number from a contact list,” (emphasis added).

Figure 16 compares Palm’s patent with the iPhone’s dial pad. Intuitively, there are some obviousness and prior art issues (especially with respect to IBM Simon), but for now we are going to leave those aside, given the presumption of validity granted to patents.
3.7.4 - Other Palm’s patent in potential conflict with the iPhone

Palm’s biggest hit in 2001 was no doubt US Patent #7,231,208, disclosing “User interface-technique for managing an active call”. Such patent describes (in detail) a conference call management system, exactly like the one implemented on the iPhone. The interface allows to put calls on hold, and managing them independently from the screen. More in detail, claim 1 discloses an interface:

“* * * initiating a first call at the request of a user;

placing the first call on hold at the request of a user and placing an indicator representative of the first call in a hold section of the display and re-
moving the indicator representative of the first call from an active section of the display;

displaying to a user an available section of the display including a new call option;

initiating a second call at the request of a user by selecting the new call option;

and placing an indicator representative of the second call in the active section of the display.” Figure 17 compares the iPhone's screen and the drawings in Patent ‘208.
The Multi-Touch™ patent: software cold war in the ICT industry

3. Apple’s Multi-Touch™

Figure 17

Picture credits: www.engadget.com
Palm further patented as well a “System and method for detection of an accessory device connection status”\(^{176}\). The feature covered is, “if the communication device is actively connected, the portable computer suspends implementation of a time-out feature that would otherwise reduce power consumption of the portable computer.”\(^{177}\) This feature is as well implemented on Apple’s device.

3.7.5 - Conclusions from the Palm case

Table 2 shows a reference table of Apple and Palm’s patents. Palm’s patent haven’t been classified under the same Classes assigned to most of Apple and Elan’s patent. They can be however considered software patents. Being most of Palm’s multi-touch related patents filed relatively recently, it is reasonable that they do not have a significant number of references. The most relevant (Patent #7,007,239) is referenced by other 13 patents, 8 of which are assigned to Palm itself.

<table>
<thead>
<tr>
<th>Patent #</th>
<th>Assignee</th>
<th>Ref by Assignee</th>
<th>Ref. Class</th>
<th>Ref. Class</th>
<th>Main US</th>
<th>Filing date</th>
</tr>
</thead>
<tbody>
<tr>
<td>6323846</td>
<td>Delaware University</td>
<td>72</td>
<td>35</td>
<td>11</td>
<td>8*</td>
<td>345/173</td>
</tr>
<tr>
<td>6677932</td>
<td>Fingerworks</td>
<td>16</td>
<td>10</td>
<td>5</td>
<td>7*</td>
<td>345/173</td>
</tr>
<tr>
<td>6570557</td>
<td>Fingerworks</td>
<td>17</td>
<td>13</td>
<td>4</td>
<td>7*</td>
<td>345/173</td>
</tr>
<tr>
<td>6888536</td>
<td>Delaware University</td>
<td>8</td>
<td>8</td>
<td>2</td>
<td>4*</td>
<td>345/173</td>
</tr>
<tr>
<td>7007239</td>
<td>Palm</td>
<td>13</td>
<td>1</td>
<td>0</td>
<td>8</td>
<td>715/780</td>
</tr>
<tr>
<td>7296107</td>
<td>Palm</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>710/304</td>
<td>28-ott-2003</td>
</tr>
<tr>
<td>7339580</td>
<td>Apple</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>345/173</td>
<td>17-dic-2004</td>
</tr>
<tr>
<td>7268775</td>
<td>Palm</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>345/204</td>
<td>17-mag-2005</td>
</tr>
<tr>
<td>7231208</td>
<td>Palm</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>455/416</td>
<td>17-ott-2007</td>
</tr>
<tr>
<td>7469381</td>
<td>Apple</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>715/702</td>
<td>14-nov-2007</td>
</tr>
<tr>
<td>7479949</td>
<td>Apple</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>345/173</td>
<td>11-apr-2007</td>
</tr>
</tbody>
</table>

\(^*\) = all within US Class 345/173


An extensive prior art research is not the purpose of the present paper. Nevertheless, being the cited patents just few examples from Palm’s and Apple portfolios, there’s very few doubt that both companies are currently not infringing on each other’s intellectual property. A cross-licensing agreement looks the more reasonable solution, since a mutual injunction suspending the sale of the devices would be a lose-lose situation.

Finally, in the light of the extensive portfolio possessed by the two firms, chances are that the case will basically stay a PR conflict case.

3.8 - Conclusions from the cases

The analysis of the patents makes also more understandable the importance of KSR\textsuperscript{178} with respect to software. The companies are disclosing a number of inventions that, in the light of the present art, might seem to fail the requirement of non-obviousness. The question is therefore: does an idea such as search-by-initials feature, or the suspension of auto-dimming when connected to power source, or showing the edge of a document when scrolling, really possess the inventive step required for patentability. In the light of this consideration, it is understood how a legal suit might involve questioning the validity of both part’s important intellectual assets on anticipatory and obviousness grounds. This would substantially result in a mutual weakening of each firm’s competitive position. It is also noticeable the low number of references that patents filed from 6-7 years receive.

The relatively recent development of multi-touch technology, together with the intrinsic complexity of software as patentable subject matter, and

\textsuperscript{178} As discussed in paragraph 2.3.
the recent KSR\textsuperscript{179} case, presents a scenario with a very complex architecture of patents owned by the big players, where a complete and precise reconstruction of the different inventive steps would very likely go to a slower pace than the real development of the industry.

In this scenario of substantial uncertainty with respect to who can claim whose IP assets, it is naturally more convenient for a firm with relevant dimensions to extend its patent portfolio, regardless of whether this is actually enforced or not. Software patents appear to be more suitable for bargaining and access purposes, rather than actual exclusiveness.

\textsuperscript{179} 550 U.S. 398 (2007).
4. Apple: an effective strategy?

4.1 - Intro

The analysis of Apple’s portfolio, compared to Elan and Palm, leaves room to uncertainty. The scenario of multi-touch related patents is rather complex. This scenario becomes even more complex when considering those patents that are not strictly related to multi-touch technology, but are nevertheless embedded into Apple, Palm and Elan products.

The purpose of this chapter is assessing overall’s Apple strategy with respect to multi-touch technology, and more specifically on its most known implementation, the iPhone. In order to do this, we will have to consider the scenario that firms face in the light of global economy.

4.2 - The Open Innovation paradigm

Fundamental aspects of the competitive scenario are the sources and the allocation of knowledge. The Open Innovation paradigm introduced by Chesborough\(^{180}\) presents us a competitive scenario which is far from the knowledge monopolies of the 70’s, when the internal R&D of the firms held a substantial slice of the technologies. Such a landscape has changed, in particular with respect to the role of Universities and smaller firms. Faculties have begun to search for industry funding for their research, adjusting consequently to become closer and closer to the needs of the market. Notably, the basic technology on which Google’s search engine relies was developed

within the academic field, not by corporate R&D. Google Inc. itself was founded by two students, Larry Page and Sergey Brin, at the time that they were PhD students at Stanford University in California\(^\text{181}\). Table 3 shows the low degree of patent concentration in the US (1999). What emerges from the data is that the top twenty patent holders possess in fact 11.6 percent of total awarded patents. Conversely, the number of patents held by small firms and individuals went from 5 percent in 1970 to over 20 percent in 1992\(^\text{182}\).

### Table 3

<table>
<thead>
<tr>
<th>Company</th>
<th>1996</th>
<th>1998</th>
<th>1999</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>13. NEC Corporation</td>
<td>1,961</td>
<td>234</td>
<td>1,005</td>
<td>1,842</td>
</tr>
<tr>
<td>14. Bayer Aktiengesellschaft</td>
<td>6,541</td>
<td>369</td>
<td>456</td>
<td>1,277</td>
</tr>
<tr>
<td>15. Westinghouse Electric Corp.</td>
<td>3,808</td>
<td>398</td>
<td>170</td>
<td>11,970</td>
</tr>
<tr>
<td>16. Matsushita Electric Ind. Co., Ltd.</td>
<td>3,193</td>
<td>224</td>
<td>343</td>
<td>1,052</td>
</tr>
<tr>
<td>17. U.S. Navy</td>
<td>7,923</td>
<td>216</td>
<td>266</td>
<td>330</td>
</tr>
<tr>
<td>18. General Motors Corporation</td>
<td>6,781</td>
<td>294</td>
<td>379</td>
<td>262</td>
</tr>
<tr>
<td>19. Xerox Corporation</td>
<td>5,165</td>
<td>219</td>
<td>252</td>
<td>551</td>
</tr>
<tr>
<td>20. Fuji Photo Film Co., Ltd.</td>
<td>3,092</td>
<td>448</td>
<td>766</td>
<td>504</td>
</tr>
<tr>
<td>Total patents awarded, top 20 firms</td>
<td></td>
<td></td>
<td></td>
<td>17,842</td>
</tr>
<tr>
<td>Total patents awarded, all firms</td>
<td></td>
<td></td>
<td></td>
<td>153,482</td>
</tr>
</tbody>
</table>


Another significant indicator is the percentage of R&D expenses in firms. Table 4 shows how, from 1981 to 1999, smaller firms have four-fold increased their R&D expenditure, while in major firms this figure had sharply fallen from approximately 70 to 40 percent.

---


Traditional vertical integration seems to let place to a more dynamic scenario where knowledge is much more dispersed, as well on an international scale.

Table 4

<table>
<thead>
<tr>
<th>Company Size</th>
<th>1981</th>
<th>1989</th>
<th>1999</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1,000 employees</td>
<td>4.4</td>
<td>9.2</td>
<td>22.5</td>
</tr>
<tr>
<td>1,000 – 4,999</td>
<td>6.1</td>
<td>7.6</td>
<td>13.6</td>
</tr>
<tr>
<td>5,000 – 9,999</td>
<td>5.8</td>
<td>5.5</td>
<td>9.0</td>
</tr>
<tr>
<td>10,000 – 24,999</td>
<td>13.1</td>
<td>10.0</td>
<td>13.6</td>
</tr>
<tr>
<td>25,000 +</td>
<td>70.7</td>
<td>67.7</td>
<td>41.3</td>
</tr>
</tbody>
</table>

scale. Accessing technology is much easier now than 30 years ago and in order to enter the market, small firms can create as little new knowledge as possible.

In the light of the Open Innovation paradigm, the diffusion and the accessibility of knowledge appear to make more difficult to effectively sustain a competitive advantage, relying on sole technological innovation.

4.3 - The Knowledge Economy: what really drives competitive advantage?

A number of factors changed the characteristics of today’s global economy, which is progressively more based on information flows, rather than raw material processing. Those flows are reproducible at a low cost (compared to traditional physical assets) and can be transmitted very rapidly. Open markets make access to complementary assets much easier than in the past. The combination of the two (information-based economy and progressive efficiency of markets) makes a mere market-based exchange relationship not profitable anymore, at least in most cases. In fact, with a tendency towards market efficiency, the traditional sources of competitive advantage are not yielding profits anymore, being those market relations (progressively more often) easily replicable by incumbents. Knowledge itself has become a tradable good, and in fact the market of intermediate goods had substantially expanded. The financial derivatives are one of the most evident

183 As Chesborough points out, at Stanford University and at the Massachusetts Institute of Technology, more than half of the scientists and engineers at post doctoral level are not from the US. See National Science Foundation, *Science and Engineering Indicators*, NSF/Scientific Resource Study (Washington, DC: National Science Foundation, 1998).

examples, as well as patents, trademarks, databases, and other forms of information.

In such a scenario, dynamic capability becomes fundamental to survive in the market. Such capability is the ability to successfully find and exploit opportunities, managing knowledge, competences, complementary assets and technologies, in order to finally achieve a sustainable competitive advantage.185

4.3.1 - Increasing returns in the knowledge economy

Appreciating the importance of dynamic capability is not of course per se sufficient to understand the firm’s competitive panorama. One important factor are the increasing returns, as opposed to the “Law of the diminishing returns” introduced by early economists186. This law assumes that firms within an industry, assuming an identical production function, face progressively diminishing margins of profit as newcomers enter the market. While this can be true within a more traditional economy with a constant production function, this assumption no longer holds in the modern economy. This is because technology is included within the production function. And, in the big part of modern markets, knowledge is “far from being shared ubiquitously and passed around at zero cost”187. The shift from an economy based on manufacturing and raw material processing to a knowledge economy led to increasing returns in business activities. More specifically, “this phenomenon is usually paramount in knowledge-based economies”188. There

are some elements that reinforce positive feedback and thus the position of the leading firms. Those elements are standards, network externalities, customer lock-in, up-front costs, producer learning.

4.3.2 - The mechanisms of increasing returns in detail

Technological development is very often path dependent, and has cumulative nature\(^\text{189}\). In short, technologies develop one from the other, following certain paths and building upon certain paradigms. It’s intuitive how the establishment of a *standard* design plays a crucial strategic role, especially with respect to *network externalities*. The most common example is that of operative systems in the computer industry. The more a technology is diffused, the more beneficial it will be to consumers because of network externalities.

*Customer lock-in* is as well to be considered. The more a customer invests in a product, the higher his switching costs will be. This investment can be the product itself, its complementary goods, or - simply - the learning process.

*Up-front costs* (research, development, design engineering) within the high-tech industry, are typically large. In our case, the software industry, they are even more exacerbate, since creating a single copy of a program includes all the production costs, while the others copies cost nearly nothing\(^\text{190}\).

The last factor to consider is *producer learning*. Is widely recognized that an important part of knowledge is tacit: such kind of knowledge - often referred as know-how - is hardly transferable, being itself difficult if not im-


possible to articulate and codify\textsuperscript{191}. Moreover, it doesn’t appear in the product, being mostly part of the process. Therefore, this kind of knowledge can be acquired only by hiring people that possess it, or through costly processes of formalization.

Increasing returns present us a market where the winner takes it all (or a very high share). Corporate strategies in such a scenario must focus on convey the right resources in the right time frame, in order to be in the right position when the market standards are defined. As Teece appropriately states, “superior technology alone is rarely enough upon which to build competitive advantage”\textsuperscript{192}. The dynamism of competition, and the rate of technological innovation, leave little room to careful cost minimization, which can no longer be a sustainable source of competitive advantage. Simply put, the frame is rarely stable enough in order to focus on the minutiae.

4.3.3 - Conclusions from the competitive scenario

In the light of the prior evidence, we are presented with a scenario that is highly unstable, especially when a standard design has not been defined yet. Considering the diffusion of knowledge, an incumbent firm has to leverage its increasing returns, in terms of customer loyalty, network effects, standards, customer and producer learning, in order to retain a sustainable competitive advantage.

In the light of this, I will now analyze Apple’s competitive strategy.


4.4 - Apple’s strategy

The multi-touch technology (in its broader meaning) was not invented by Apple. The evidence shows that complex implementations exist since more than 20 years. Nevertheless, it is Apple that successfully brought it to the mainstream with its iPhone, having for long time excluded a big part of the competitors from implementing multiple fingers on portable devices. Apple’s foresaw the potential of Fingerwork’s technologies, acquired the company and hired its founders (namely Westerman and Elias)\(^{193}\). The company therefore based its technology\(^ {194}\) on the work of a PhD student and his presenting professor, in fact profiting from the benefits of the Open Innovation paradigm. Steve Jobs was as well very aware that, in order to retain competitive advantage, technology itself was not enough. And in fact, Apple’s products are largely recognized to be very well thought in terms of marketing. Simple, user friendly, with a strong brand identity. Apple software becomes an experience, consistent with the brand identity (that allows a sharp price premium with respect to the mere production costs in most of Apple products), and with other products as the iPod. As effectively synthesized in Job’s recent biography\(^ {195}\), “iPod, iTunes, therefore I am”. Which is the role of Apple’s patents within its market strategy?

4.4.1 - A look to pending applications

The successful implementation of university-developed technologies, together with Apple’s strong brand identity is not enough to explain the success

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\(^{193}\) As discussed in chapter 3.

\(^{194}\) Especially with respect to proxy images and finger chord manipulation disclosed in US Patent #6,323,846.

\(^{195}\) Jeffrey S. Young, William L. Simon, iCon: Steve Jobs, the greatest second act in the history of business, Jon Wiley & Sons, 2005.
cess of its products. Well before the launch of the iPhone, Apple filed a number of related patents. There are several pending patent applications, and it is very unlikely that Apple’s purpose is to share its intellectual assets in a open knowledge scenario. Some of those applications are extremely interesting, and can help in order to understand Cupertino’s strategy.

For example, Patent Application #20060097991 discloses, in claim 1 “a touch panel having a transparent capacitive sensing medium configured to detect multiple touches or near touches that occur at the same time and at distinct locations in the plane of the touch panel and to produce distinct signals representative of the location of the touches on the plane of the touch panel for each of the multiple touches.”. The scope of the claim is very broad, and would in fact patent multiple touch sensing with a different response according to the location of the fingers on the screen. A number of other applications is pending, disclosing a number of behaviors, such as “Unlocking a device by performing gestures on an unlock image” and “Multipoint touch surface controller”. But most interesting application is “Multi-Touch Gesture Dictionary” where the intention is to patent a language of gestures, that could potentially establish a standard set of gestures to be implemented on multi-touch devices.

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4.4.2 - Which IP strategy?

It’s clear that Apple’s patents (and patent applications) disclose some very specific behaviors that, in fact, distinguish Cupertino’s user experience from that of the competitors, and are nevertheless a founding pillar of Job’s strategy. It’s uncertain to which extent Apple’s intellectual assets will be in fact used to completely exclude the competitors. Palm’s Pre has started to be sold, and Apple didn’t make a move yet. An exclusive strategy (at least, towards incumbent firms) seems not to be practicable. Nevertheless, the protection of some very specific implementation is certainly possible. Those implementations are not fundamental to multi-touch per-se but very useful from an user-experience perspective, and therefore functional to retain a competitive advantage on the competitors, establish a standard, distinguish the Apple experience. Apple’s pending application on a “Multi-Touch Gesture Dictionary”200 (shown in Figure 18) reveals the intention of making not Apple’s multi-touch, but the Apple experience itself, the benchmark for each firm willing to compete in the market. Being multi-touch relatively new to the mainstream, and probably no longer Apple’s exclusive in the coming years, *is Apple trying to set a standard?*

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Apple’s large portfolio is surely to be used as well as an access medium. This strategy was made famous by IBM years ago:

“You get value from patents in two ways: through fees, and through licensing negotiations that give IBM access to other patents. The IBM patent portfolio gains us the freedom to do what we need to do through cross-licensing--it gives us access to the inventions of others that are the key to rapid innovation. Access is far more valuable to IBM than the fees it receives from its 9,000 active patents. There's no direct calculation of this...
value, but it is many times larger than the fee income, perhaps an order of magnitude larger.”

Through cross-licensing its portfolio, Apple will very likely get access to the patents it needs. A stricter enforcement is plausible on those aspects that are particularly valuable and distinctive (for example the cut-copy-paste gestures, and the Gestures Dictionary, if the patent will be issued). Significantly, Apple received a trademark on the term Multi-Touch, marking the distinction between its experience and the one of other firms.

4.5 - Conclusions: leveraging IP to foster increasing returns

Apple has been the sole producer to commercialize mainstream devices implementing multi-touch technology. As an innovator and leader (with respect to multi-touch devices), Apple’s strategy aimed to retain the initial technological advantage, leveraging the factors that typically influence increasing returns on scale. Products such the iPhone, the iPod Touch and the MacBook can count on an increasing number of network externalities: the iTunes platform, the iTunes store, the AppStore for iPhone, the agreements with Google (YouTube “buy in iTunes” function, the iGoogle portal), other than the strong brand value. Apple is apparently willing to set a standard language of gestures on Multi-Touch devices, setting the “Apple experience” as the benchmark for every incumbent firm. Regardless the vagueness of the term, the experience that Cupertino’s firm delivers to its customers appears to be unique and distinctive (or at least, perceived as such). An-

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other important factor is producer learning: Apple retains a very valuable know-how that is of undeniable advantage. And in fact, Palm’s response was to hire a former Apple designer in order to grasp some of this know-how.\footnote{John Markoff, “Palm hires Apple designer in response to iPhone”, NY Times, Mar. 9, 2007, available at \url{http://www.nytimes.com/2007/03/09/technology/09iht-webpalm.4856455.html}}

While the extent of protection that Apple can claim on its IP is finally uncertain, it is nevertheless true that Job’s position is one of noticeable bargaining power with respect to the competitor, holding a competitive advantage based only partially on technology itself.

Finally, Apple’s strategy seems to be overall effective and well-thought in the long run. Its portfolio initially prevented the competitors from implementing the multi-touch technology, even if capable of (Google’s Android), leaving the leading Cupertino firm the time to develop expertise, protect some distinctive aspects (included trademarking the Multi-Touch\textsuperscript{TM}) as well as exploiting a number of network externalities and a very strong brand identity.
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