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Strategies Used by Patentees to Delay Patent Disclosure in Literature Searches and Measures for Counteracting Them

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In the context of today's knowledge-based economy, in which creation, distribution, use, and accumulation of information are the primary forces driving wealth and jobs, intellectual property rights represent an important arrangement between the inventor and the government through which the former is granted strong protections by the latter in exchange for "disclosure" to the general public upon expiration of the legally determined protection period. The ultimate goal of such an arrangement is to promote inventions, thereby supporting industrial progress. In accord with this, under the patent system, disclosure of the information related to the patented invention is the prerequisite for obtaining the exclusive right to a novel technology. However, using the loophole provided by the cost-intensive and time-consuming process of analyzing the exponentially increasing patent documentation required around the world, an increasing number of firms try to maintain a competitive advantage by drafting their patent documents in a manner allowing the delay of their actual public disclosure. The current study investigated actual cases of strategies for delaying public disclosure of patents used by some companies when drafting patent documents, and discusses possible measures for more efficient mining of patent literature and related institutional improvement to address this issue.

Keywords: Patent filing, patent map, patent information, IP strategy, patent examination, patent disclosure

With increasing awareness of the importance of technical innovation as a determinant factor for the competitiveness of a country in the global market, countries around the world are putting effort into protecting the results of technical innovation with various legal and institutional systems. Among such systems, patent protection encourages inventive efforts for technological innovation and stimulates development and the spillover of technological innovations by granting exclusive rights to the inventor for a legally specified duration of time.[1] A knowledge-based economy strongly relies on the creation, distribution, and use of intellectual property, which are considered to be the primary drivers for generating wealth in today's industry setting. Companies analyze and use global intellectual property information to forecast technology trends for maintaining competitive advantages.[2] Patent protection regulations are intended to provide protective and exclusive patent rights to inventors in exchange for their contributions to industry by disclosing their intellectual property to the public.[3]

As repeatedly emphasized in previous works, the development and use of innovative ideas and knowledge are important elements constituting core competencies of a company. [4,5,6] In particular, to ensure the continuous contribution of knowledge to economic achievement in the highly competitive environment, it is necessary to prevent rival organizations from appropriating the knowledge. In this regard, a series of studies representing a resource-based view argued that resources and knowledge exclusively procured and attained by an organization function as the core competency for achieving continuous competitive advantage.[7] According to the views held by previous studies emphasizing exclusive corporate profits, hiding useful knowledge from outward exposure and keeping business secrets are the only means of protecting valuable knowledge.[8] In reality, however, companies use various tactics to protect their knowledge, choosing protective methods suitable for the type of knowledge and sector-specific characteristics.[9]

Although the protection of knowledge provided by patent regulations is limited to the scope of content specified within patent applications, it allows companies to maintain their exclusive benefits without continuously investing time and effort to protect the achievements of their knowledge

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acquisition and R&D. In particular, regulatory patent protection is a convenient instrument for the protection of intellectual property of technological inventions, which is by nature difficult for companies to protect on their own, despite the need to prevent competitors from using it for their strategic advantage.[10,11]

As shown in Figure 1, the number of patent filings worldwide has been continuously increasing. The graphs therein depict the trends of abrupt increase since 1980, indicating explosive worldwide expansion of the amount of patent bibliographic data. The increased volume of the patent data costs excessive amounts of time and effort for analysis, which is essential for establishing technology strategies; moreover, the process relies on the cognitive performance of analysts in interpreting and comparing the qualitative importance of patents. There have been a number of cases that imply possible attempts to delay these cognitive processes, even though the entire contents of the patents are publicly disclosed. The attempts are presumed to result from strategies to occupying auspicious positions in patent litigations with competitive technologies that are relatively less recognized by others. Such strategies are counter to the purposes of the patent system, if not illegal, since they hinder the well-intentioned and virtuous cycles of intellect. This paper examines cases of such cognition impediment strategies for patents to suggest an effective strategy for interpreting and using patent information and to consider political alternatives for retrieving the original purpose of patent system.

U.S. Patent Law

Under current U.S. patent law, any new and useful process, machine, manufacture, composition of matter, or any new and useful improvement of an existing invention may obtain a patent under the non-obviousness condition (35 U.S.C. §101 Inventions patentable). The law provides patentees exclusive rights on the patents within the term of expiration; however, patent applicants agree to disclose the details in entirety to the public by a specified date, so that the inventions can contribute to industries with advanced science and technologies (35 U.S.C. §154 Contents and term of patent; Provisional Rights). The disclosure enforcement is intended for efficient management of the patent system. Published, filed applications are publicly available, so that the information can be used for developing more advanced technologies. Therefore, examiners refer to the patent bibliographies as judgment criteria of patent abilities. Comparing to the content of the publicly accessible patent applications, a patent examiner can decide on the novelty (35 U.S.C. §102 Conditions for patentability; Novelty) and the non-obviousness (35 U.S.C. §103 Conditions for patentability; Non-obvious subject matter) of the technology of a filed patent application afterwards, and the technological information of an invention described in patent documents can be used for the development of more advanced technologies.

Despite the exclusive protection under patent law system, mandatory disclosure provides the entire technological contents to third parties, including the

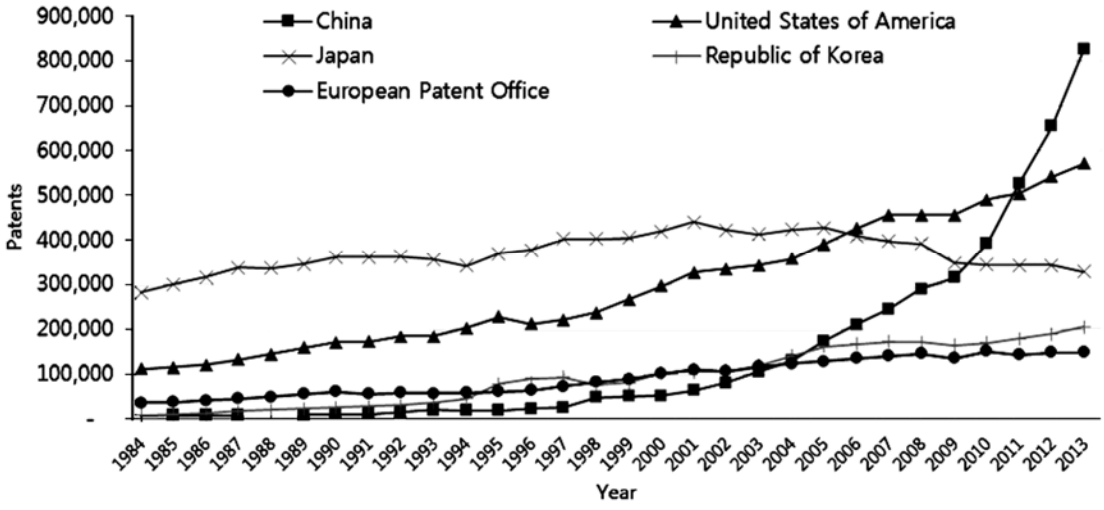

Fig. 1 — Patent applications for the top 5 offices

Note: The top five offices were selected based on total patent applications filed in 2013. WIPO statistics database, October 2014.

competitors of patentees, which might imply possible reversal of technological competitiveness in the future. Such foreseeable disadvantages of patent disclosure have led companies under extreme competition to attempt impediments of cognition process of patent analysts who detect emerging technologies and establish IP strategies. The current authors conjecture that the attempts have been successful, in that they have effectively caused blunders in patent analysis; however, such blunders imply drawbacks in current systems and procedures, which motivated our study (35 U.S.C. §271 Infringement of patent). The following sections present an overview to help understand such attempts at delaying the exploitation of the knowledge disclosed in the claimed invention by third parties by deliberately clouding or complicating the cognitive process of understanding and applying it.

Regarding the level of information disclosed in the documents of a filed patent application, the "detailed description of the invention" required is a clear and detailed written description of the technological content of the claimed invention. U.S. Code § 112 describes the disclosure requirements for patent specifications. According to the requirements, the written description of an invention should be in clear and exact terms to enable any skilled person in the art to materialize the invention for use. In addition, the best mode of the invention contemplated by the inventor or joint inventor should be provided. A patent specification is required to conclude with one or more claims, which point out the subject matter of the invention. 35 U.S.C § 112 and 35 U.S.C 113 describe patent disclosure and claim structure. In the USPTO (U.S. Patent and Trademark Office) process, the scope of disclosure includes the detailed description, specification (including the claims), and drawings. Specifically, it includes detailed description specification of the invention (37 CFR 1.71), title and abstract (37 CFR 1.72), summary of the invention (37 CFR 1.73), reference to drawings (37 CFR 1.74), claim(s) (37 CFR 1.75), arrangement of application elements (37 CFR 1.77), drawings required in patent application (37 CFR 1.81), and content of drawing (37 CRF 1.83).

An inventor is asked to file a patent application with the specification that provides detailed disclosure of an invention, following the MPEP (Manual of Patent Examining Procedure) and the CFR (Code of Federal Regulations). The detailed disclosure requirement is intended to secure reciprocal public benefits in exchange for the patent privilege for the inventor. It aims to enrich public knowledge for facilitating research and innovation, with the eventual benefit of using the invention at no cost, after the patent right expiration.

Title and Abstract of the Invention

The MPEP and CFR specify that the title and abstract of the invention should be "brief but technically accurate and descriptive" and may "not exceed 500 characters in length." However, briefness can be scarified in favor of bibliographic information useful for indexing, classification, and research. The abstract was introduced to facilitate the use of the bibliographic information contained in patent applications, in response to the growing number of application filings and increasing complexity of their technical contents. A patent summary includes the representative drawing, to facilitate searches of the invention by the public. The content of a patent abstract does not affect the scope of protection of the invention seeking patent protection; thus, false descriptions therein cannot be the reason for issuing patent refusal notice. Additionally, applications with no abstract attached or an abstract drafted improperly can receive a request to amend the application in compliance with MPEP guidelines.

Detailed Description and Specification of the Invention

The description of the invention should be clear and detailed enough for "a person of ordinary skill in the pertinent art" of the claimed invention to understand and use the invention, and should include detailed information on the technology field, the problem to be solved, the problem-solving method, and items necessary for a person skilled in the art to easily understand the content of the invention.

Drawings

Drawings are provided if necessary for explaining the invention sought to be patented or useful for understanding the components of the invention as described in the specification. Although there are no legal specifications for cases where drawings are mandatory, a product invention should include drawings, unlike material or method inventions, to specify the invention in the review process.

Claim(s)

One or more claims should be provided to define the scope of the protection sought. Each claim should be supported by a detailed explanation of the invention

described in clear and succinct expressions. The scope of protection of an invention is determined based on the claims made in the application documents, which constitute the basis for exclusive rights pertaining to the invention once the patent is filed.

Literature Review

In contrast to conventional patent-related researches focusing on the patent right itself, such as its efficiency and impact on technological innovation, patentee behavior has taken center stage in recent studies. Studies on patent examination can be classified into two strands: (i) studies investigating the time between patent application and grant;[1,12,13,14,15,16,21,22] and (ii) studies analyzing the motives for filing the request for examination a while after filing the application, instead of immediately requesting examination .[17]

Important inventions are disclosed in patent documents years before being published in non-patent literature. For example, the punch card technology was disclosed in its patent application filed in 1889, but was published in non-patent literature in 1914. A television system technology was disclosed through its patent application in 1923, but published in non-patent literature in 1928.[18] The same was true for the jet engine, in 1936 and 1946. In the chemistry sector, the average time from the disclosure of inventions through patent application to their publication in academic journals in the U.S. is almost 10 years.[19, 20] Harhoff and Wagner (2009) noted that a patent is an excellent means for obtaining information on competitors' R&D, and that information taken from patent databases has a great impact on competitors' R&D and technology management strategies. This implies that deliberately faulty patent applications can be used for strategically delaying the time to information leakage, thus preventing rival firms from obtaining useful technological information on the invention.[13] In other words, companies can use the patent bibliographic data as a means to prevent rival firms from establishing technological R&D programs. According to the results of a questionnaire survey on patent database and inventors conducted by Henkel and Jell,[17] the reasons for postponing the request for examination of the pending applications can be boiled down to: (i) competitors' insecurity of investment, and (ii) evaluation of patent value of the filed patent application.

Limitations in Patent Literature Analysis

Patent analysis aims at selecting core patents from collected raw data. During the analysis process, effective patents are picked by removing noise from the raw data. The core patents are selected from the effective patents by considering the originality of technologies. In the process of classifying the technological information extracted from the filtered dataset, patent documents with low relevance to the technologies searched are eliminated along with noise, ultimately leaving only effective patents. In a quantitative analysis, effective patents are categorized by items such as an applicant for a patent, year of patent filing, country of patent filing, or field of technology. Of the effective patents thus analyzed, core patents are selected from those having technological originality or obstructing business operations. Qualitative analysis is then performed in line with the intent of the report to be drafted, including the process of establishing non-infringement defenses and invalidity arguments. To derive core patents for final qualitative analysis, the following process steps are necessary: selection of effective patents by removing noise and low-relevance patents from the raw data; technological classification of the effective patents by branching them in a technology tree; and selection of core patents according to technological relevance.

In Korea, patent mapping has been performed at the government level and the resulting patent maps have been offered free of charge by the field of technology since 2000 (Patentmap: http://www. patentmap.or.kr). This government-initiated project aims to achieve timely detection of technologies that are strategically important in the 21st century *via* patent mapping that can contribute to establishing national technological policies and systemizing core and original technologies for venture firms, and to set the directions and define objectives for national industrial technologies for the purpose of analyzing them systematically and macroscopically. As of 2014, the raw data of 20 patent maps in the field of electrical engineering and electronics contain 16,770 cases on average.

Table 1 presents the results of calculating the unit time actually required for filtering effective patents from the respective raw data. The unit time is defined as the time required for deciding whether a patent case in the raw data is noise or carries relevance, calculated on the basis of 8 working hours a day, and 20 working days a month. Table 1 shows that it takes 1.7 months to extract effective patents out of the 16,777 patent cases in the raw data, assuming that 1 min is required for checking 1 patent. If 5 minutes are required for determining whether a patent is effective or not, it will take 8.7 months to check all patent cases contained in the raw data.

Table 2 presents the results of calculating the time required for determining core patents from among effective patents extracted from 20 patent maps (mean number = 6,838). If it is assumed that 5 minutes is required for determining the core patent eligibility of an effective patent, it will take 3.6 months to check all effective patents, and 17.8 months at the unit time of 25 minutes. In other words, with the minimum necessary time for effective patent mining and core patent mining of over 5 months (1.7 + 3.6 months), the process of extracting core patents for qualitative analysis is extremely time-consuming work.

The time required for core patent decisions should depend on technical complexities. Nonetheless, there are realistic barriers for an analyst to comprehend and decide technical relevance and importance of a patent within the limited time allowed for the reasoning. Therefore, in patent analysis practices, there has been strong reliance on abstracts, summaries, and drawings for efficient comprehension. However, there have been reports on cases that imply intentional barriers imposed for delaying the comprehension processes. The next chapter identifies examples of stalling techniques, categorized by patent analysis processes.

Table 1 — Time required for mining effective patents

Unit time (min)	Raw data	Time required (min)	Time required (hour)	Time required (day)	Time required (month)
1	16,770	16,770	280	35	1.7
2	16,770	33,540	559	70	3.5
3	16,770	50,310	839	105	5.2
4	16,770	67,080	1,118	140	7.0
5	16,770	83,850	1,398	175	8.7

Table 2 — Time Required for Mining Core Patents

Unit time (min)	Raw data	Time required (min)	Time required (hour)	Time required (day)	Time required (month)
5	6,838	34,190	570	71	3.6
10	6,838	68,380	1,140	142	7.1
15	6,838	102,570	1,710	214	10.7
20	6,838	136,760	2,279	285	14.2
25	6,838	170,950	2,849	356	17.8

Stalling Strategies for Substantial Patent Context Disclosure

Stalling Strategy for Patent Summaries

Patent summaries should provide information on technology areas, specific problems to be solved, and the expected benefits from the suggested solutions. However, it is possible to compose the summaries without describing technical characteristics, by providing only general terms. The patents in such cases can be made as invisible for longer durations, if searches are performed with specific keywords. US 8,816,*** B2 in Table 3 is a summary of a registered patent that reveals an exemplary strategy to stall patent recognition during technology search processes, as the text is composed without exposing any keywords for technology description.

Moreover, as shown in Table 3, the patent summary of US 8,279,*** B2 is composed using the same text as US 8,816,*** B2, making both patents indistinguishable unless the patents are scrutinized in detail. [Table 3]

Stalling Strategy for Representative Drawings

Representative drawing refers to the drawing provided to succinctly express the invention, playing the role of showing intuitively the content of the invention. As such, it is the most efficient part used for effective mining of core patents from patent bibliographic data. However, as an example of how such drawings can be unsuitable in mining efforts, the representative drawings of Apple's patent documents do not objectively show the problems of conventional touch screen technologies. This makes the representative drawing of the Apple patent unsuitable as the reference drawing for efficiently extracting core patents from the huge amount of related patent bibliographic data. Patent analysts have difficulty intuitively understanding Apple's patent technology by referring to its representative drawing, and are thus forced to read the entire set of patent documents to understand the patent technology, resulting in the delayed or limited understanding of Apple patent technology disclosure. If the same drawing is intentionally presented as the representative drawing of

Table 3 — Apple Inc.'s abstract

US 8,816,*** B2	US 8,279,*** B2
A multipoint touch surface controller is disclosed herein. The controller includes an integrated circuit including output circuitry for driving a capacitive multi-touch sensor and input circuitry for reading the sensor. Also disclosed herein are various noise rejection and dynamic range enhancement techniques that permit the controller to be used with various sensors in various conditions without reconfiguring hardware.	A multipoint touch surface controller is disclosed herein. The controller includes an integrated circuit including output circuitry for driving a capacitive multi-touch sensor and input circuitry for reading the sensor. Also disclosed herein are various noise rejection and dynamic range enhancement techniques that permit the controller to be used with various sensors in various conditions without reconfiguring hardware.

two or more application documents, the patents with the same representative drawing are likely to be combed out by patent analysts.

As another example of Apple's stalling strategy to delay disclosure, its U.S. patents US 8,816,***B2 and US 8,279,***B2 present Drawing 9 as the representative drawing instead of Drawing 2 in the specification, which can explain the corresponding patent technology intuitively. The inadequacy of Drawing 9 in explaining the technology that it is supposed to represent forces patent analysts to resort to supplementary reading in order to understand Apple's patent technology presented as the prior art in Drawing 9. The strategy of presenting identical representative drawings for two or more patents has the effect of stalling the recognition of patents by intentionally leading the patent analysts to mistake them as family patents in the first and second rounds of filtering, after downloading the limited contents that include the representative drawing while examining the previous studies. (Figure 2)

Stalling Strategy for Titles

If an overly high number of patent cases are yielded in a search, the number can be reduced by narrowing the search criteria, e.g. from claims and other items, to only the title of the invention. In a practical setting, working hours for patent information analysis are determined according to the personnel costs, and the preset work-to-pay ratio can be maintained by controlling keywords so as to yield an optimal number of detected patent cases. Exploiting this loophole, attempts are made to escape the hit list by intentionally giving the invention an elusive title.

For example, in the case of an invention relating to a liquid crystal display device whose special feature is the protection film, entering "liquid crystal and displays and devices" as keywords for title search yields as many as over 10,000 registered patents. Narrowing the search scope with the keywords "film and protect and liquid crystal and displays and devices," 32 registered patent cases (U.S. as of 10 May 2015) are found, including "liquid crystal display device with protection film." If the title of the invention is given as "liquid crystal display device," the chance that it is detected with the keywords given above is very low. On the other hand, using even more general terms, such as "flat panel display device," can actually be even more effective in stalling recognition. Table 4 lists seven of Apple's pending patents with their application number, filing date, and title. These seven pending patents have different contents of invention sought to be protected because the applications contain different claims. However, by titling them all with the same wording "Touch screen liquid

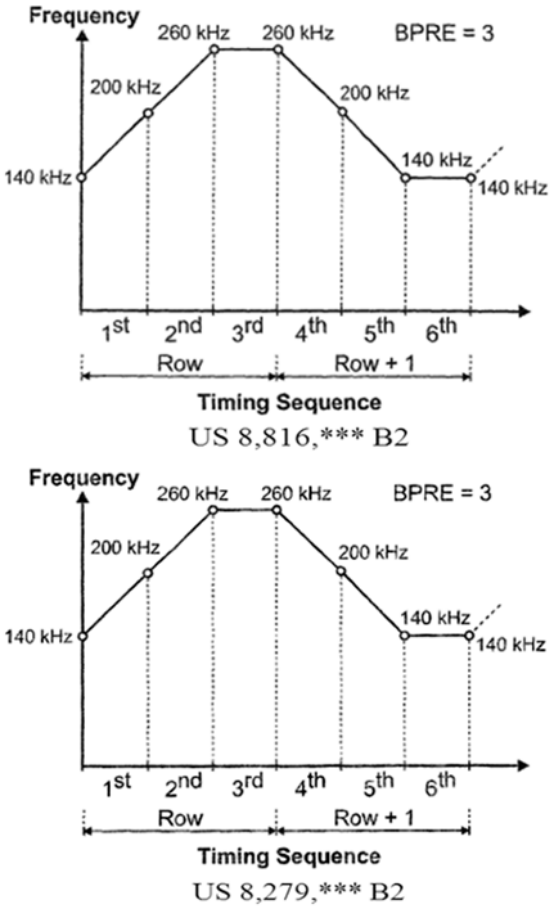

Fig. 2 — Apple Inc.'s representative drawing

Table 4 — Apple's patent documents with the same title

No.	Registration No.	Date of application	Applicant for a patent	Title of the invention
1	US11/760,***	2007.06.08	Apple Inc.	Touch screen liquid crystal display
2	US13/538,***	2012.06.29	Apple Inc.	Touch screen liquid crystal display
3	US11/760,***	2007.06.08	Apple Inc.	Touch screen liquid crystal display
4	US11/760,***	2007.06.08	Apple Inc.	Touch screen liquid crystal display
5	US11/760,***	2007.06.08	Apple Inc.	Touch screen liquid crystal display
6	US11/760,***	2007.06.08	Apple Inc.	Touch screen liquid crystal display
7	US14/174,***	2014.02.06	Apple Inc.	Touch screen liquid crystal display

crystal display," their differences have been completely camouflaged. This enhances the chances that the technical features of the contents claiming their respective scopes of protection are not analyzed by patent analysts while processing a large amount of patent bibliographic data, thus stalling their recognition.

Stalling Strategy for Detailed Descriptions

U.S. patent US 7,382,*** B2, filed by Synaptics Incorporated, describes the invention as a “one layer capacitive sensing apparatus having varying width sensing elements" in the detailed description, using 16 drawings, and seeks patent protection with 61 claims. Therein, Synaptics Incorporated presents a drawing that does not give any clues as to the contents of the invention (Fig 3) as the representative drawing, explaining the general composition of a touch screen and the invention’s core technology "varying width sensing elements" with another drawing. When explaining the embodiments of "varying width sensing elements," experimental data and concrete numerical data necessary for implementing the “varying width sensing elements” are reduced to minimum, and the technological idea and rationale of the invention is explained in functional details. The said application document does not contain any description of the parts that cannot be claimed as exclusive rights or are undesirable to be claimed, such as numerical limitation, limiting the description to the minimum necessary content for patent registration. This strategy fulfills the purpose of delaying actual disclosure of the invention by diminishing the scope of disclosed technical information compared to the scope of claimed protection. [Table 5]

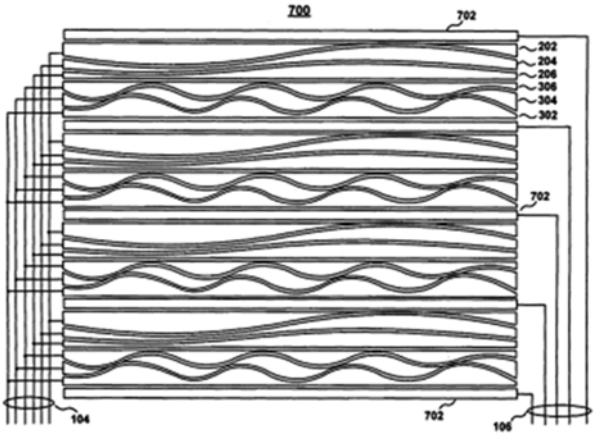

Fig 3 — Synaptics *US 7,382,*** B2* representative drawing

Table 5 — Synaptic’s claims

Claim No.	Claims
Claim 1	A two-dimensional capacitive sensor apparatus comprising: a first sensing element having varying width; a second sensing element having varying width; and a third sensing element having varying width, wherein said first sensing element, second sensing element, and third sensing element are conductive and substantially parallel to a first axis, each of said first sensing element, second sensing element, and third sensing element are located such that said first sensing element, second sensing element, and third sensing element are not required to overlap each other to determine a first location along said first axis of a two-dimensional space, and wherein a sum of the varying widths of said first sensing element, said second sensing element, and said third sensing element is substantially constant
Claim 15	A two-dimensional capacitive sensor apparatus comprising: a first sensing element having varying width and is conductive; a second sensing element having varying width and is conductive; and a third sensing element having varying width and is conductive, wherein said first sensing element, second sensing element, and third sensing element are substantially parallel to a first axis and are located such that said first sensing element, second sensing element, and third sensing element are not required to overlap each other to determine a first location along said first axis of a two-dimensional space, wherein a sum of output signals of said first sensing element, said second sensing element, and said third sensing element is substantially constant at different locations along said first sensing element, second sensing element, and third sensing element.
Claim 21	A portable electronic device comprising: a two-dimensional capacitive sensor; and a processor coupled with said two-dimensional capacitive sensor; wherein said two-dimensional capacitive sensor comprises: a first sensing element having varying width; a second sensing element having varying width; and a third sensing element having varying width, wherein said first sensing element, second sensing element, and third sensing element are each conductive and substantially parallel to a first axis, each of said first sensing element, second sensing element, and third sensing element is located such that said first sensing element, second sensing element, and third sensing element are not required to overlap each other to determine a first location along said first axis of a two-dimensional space, wherein a sum of the varying widths of said first sensing element, said second sensing element, and said third sensing element is substantially constant.
Claim 56	A two-dimensional capacitive sensor apparatus comprising: n sensing elements, wherein each of said n sensing elements has a varying width and wherein n is an integer is larger than 2, wherein said n sensing elements are conductive and substantially parallel to a first axis, each of said n sensing elements are located such that said n sensing elements are not required to overlap each other to determine a first location along said first axis of a two-dimensional space, wherein said n sensing elements comprise n waveform shapes and wherein a sum of the varying widths of said n sensing elements is substantially constant, wherein said n sensing elements vary periodically with a period greater than the length of said n sensing elements, and wherein each of said n sensing elements has a different phase so as to produce a unique output signal along its length.

Stalling Strategy for Claims

U.S. patent US 7,382,*** B2 filed by Synaptics Incorporated contains a total of 61 claims, including 9 independent claims, as outlined in the Table below. It is practically impossible for patent analysts to check all claims described in a large number of effective patents. Patent analysts usually look into Claim 1, which contains the broadest scope of claim. Consequently, only Claim 1 of this patent case is analyzed, omitting other independent claims, while the core claim is described under a claim other than Claim 1, or the device invention and method invention are described together. Thus, the core technology escapes the analysis of third parties, resulting in delaying its actual disclosure. [Table 5]

Stalling Strategy for Divisional Applications

Divisional application is filing a part of an original (parent) application containing more than one invention as a separate application. This practice aims to protect the inventor by providing opportunities to obtain separate protection of an independent invention contained in the specification of the original application, thereby guaranteeing the right of priority based on the filing date of the parent patent application.

As demonstrated in the above example of Nortal Networks Ltd., four patent applications were filed on the same date (March 30, 2006) as divisional applications from one parent application. A divisional application allows only fragmented analysis of the related technology, thus complicating understanding of the technology as a whole. The fragmented claims of the entire application must be matched to yield a whole picture to enable understanding of the content of the invention, thus delaying the exploitation of its disclosure by third parties. [Table 6]

Countermeasures Against the Strategies Stalling Patent Recognition

Evaluation of Technology Trends

Patent analysts can identify the trend of a technology field using patent bibliographic information by performing keyword searches on the titles, abstracts, and representative claims of filed patent applications, as usually employed for patent searches. Unlike evaluating the possibility for patent filing or patent infringement of the corresponding technology field, trend analysis is not affected significantly by unrecognized patents in the search process, because its primary concern is to identify the trend of the corresponding technology field as to the timing and type of an invention of an applicant for a patent. Given the proportion of the companies manipulating patent applications using the loophole of the patent law and strategic patent applications of non-practicing entities (NPEs), their stalling strategies can be considered too low to affect the estimation of the overall patent application trend. It may be of help, however, to identify the trend of a technology field by investigating the patent application status, and the timing of the leading firms in the corresponding technology field can be efficient in identifying.

Evaluation of the Possibility of Patent Filings

When using patent bibliographic information for evaluating the possibility for patent filing, it is recommendable to run a keyword search targeting the detailed description of the invention or the entire patent application documents, instead of limiting the search to the title, abstract, and Claim 1 of the invention. Such a detailed search is necessary because patent filing depends on the similarity to or difference from the prior art technology disclosed in the specification or drawings and the possibility for a person skilled in the art to be able to make the use of the invention. In doing so, not only the representative drawing, but all drawings in the patent literature should be examined via the search tool feature multiple drawing view, thus avoiding the error of being misled by a faulty representative drawing. Additionally, the information on the latest applications can be obtained by using the email notification service for paying subscribers offered by commercial search database sites.

Table 6 — Divisional applications of Nortel Networks Limited

S. no.	Registration no.	Date of application	Applicant for a patent	Title of the invention
1	US 8,274***	30.03.2006	Nortel Networks Limited	Systems and methods for OFDM channelization
2	US 7,813***	30.03.2006	Nortel Networks Limited	Methods and systems for transmission of orthogonal frequency division multiplexed symbols
3	US 7,929***	30.03.2006	Nortel Networks Limited	Method and system for combining OFDM and transformed OFDM
4	US 8,111***	30.03.2006	Nortel Networks Limited	Methods and systems for OFDM using code division multiplexing

Evaluation of the Risks for Patent Infringement

When analyzing patent bibliographic data for the purpose of forestalling patent infringement litigation, it is recommendable to run a keyword search on all claims, because the possible patent infringement can be determined by the evidence as to whether the product has used the constituent parts of the claims described in the patent application documents. Unlike the trend evaluation of the technology field, in the evaluation of patent infringement risks, keyword configuration should consider the maximum amount of protected elements in the patent bibliographic data, because the infringement of only one claim of only one patent case is enough to establish an infringement case. However varied the terms used for the same technological constituent element are, they should be checked by running keyword searches to reduce the number of unrecognized relevant patent data. In other words, when patent bibliographic data are used for the prevention of infringement litigations, all independent claims, not only Claim 1, should be examined in the process of extracting core patents, preceded by removing noise from the searched patent documents and classifying them by technology branches. This can counteract the attempts at stalling patent literature recognition by deliberately placing the representative claim among the claims other than Claim 1.

If the corresponding product uses all elements constituting the independent claims of the prior art patent, it establishes a patent infringement case, making the infringement check against the dependent claims. Dependent claims are rarely checked, because if all independent claims are not infringed except for special cases. The results of analyzing the patent bibliographic data for the patents filed by Apple and Synaptics Incorporated revealed that they strategically resort to the divisional application system and draft the scope of claim of same inventive concept under various aspects, in order to hide general patent networks or patent portfolios. Therefore, patent analysts should group the patents sharing any of the same title, abstract, and representative drawing, instead of treating them as separate patent cases. By thus uncovering that they actually belong to the same parent application, the patent portfolio composition of the rival firms can be clarified, and infringement defenses can be prepared in case of litigation.

Clarification of Patent Classification Codes

The International Patent Classification (IPC) system, currently a worldwide (62 member-countries) classification system organized by technology field, was established by the World Intellectual Property Organization (WIPO) in 1968 under the Strasbourg Agreement Concerning the International Patent Classification for the purpose of globally unifying the patent classification system. However, due to its broad scope of technologies, individual countries use their own elaborate classification systems, such as the U.S. Patent Classification (USPC) in the U.S., the File Index/File Forming Term (FI/F-term) in Japan, and European Classification (ECLA). Additionally, the EPO (Europe) and the USPTO (U.S.) jointly developed the Cooperative Patent Classification (CPC), a new patent classification system based on the ECLA, initiating its use on January 1, 2013. Since Korea does not have its own patent classification system, the CPC should be used as efficiently as possible in that country. [Table 7]

Improvement Through Patent Law Amendment

The strategies used by the firms discussed in this study to retard the recognition and exploitation of the disclosed inventions in patent bibliographic data by third parties, e.g. intentional absence or blurring of the core of the invention in the title, abstract, and representative drawing of invention, do not lead to refusal or invalidity of the corresponding pending patents. This may be ascribable to fact that the disclosure of the intention can be made in the detailed description part of the patent application documents, and the scope of exclusive rights is determined by the claims. However, such patent filing practices of some firms that abuse the loophole of the patent law to delay the recognition and use of the inventions by third parties run counter to the original character and purpose of the patent system, namely, that it is a tradeoff between the disclosure of the novel technology and the grant of exclusive rights.

Therefore, an institutional measure imposing the obligation of clear disclosure of the invention to facilitate its recognition and use is considered necessary, especially in the face of the explosively growing number of patent application filings worldwide. Specifically, an applicant for a patent should be formally obligated to disclose the distinctive features of his/her invention in the title, abstract, and representative drawing of the invention, and made responsible in case of non-compliance with the patent refusal and judgment of invalidity. Given that patent analysts spend the great majority of patent mining time and effort on checking the title, abstract,

Table 7 — Patent classification systems by country

Classification systems	Full designation	User countries	Year of creation	No. of codes	Characteristics
IPC	International Patent Classification	IPC Member countries (n = 62)	1968	~70,000	-Application of single criterion -Hierarchical system -No in-depth classification affecting patent searching endeavors
FI	File Index	Japan	1996	~190,000	-Japan's national classification system -More hierarchical and systematic classification than ECLA -Code assignment via IPCC
F-term	File Forming Term	Japan	1981	~340,000	-Application of multiple technical criteria -Application of multiple F-term for one document facilitating search through set operations -Code assignment via IPCC
ECLA	European Classification	Europe	1968	~135,000	-Europe's internal classification system -More hierarchical and systematic classification than IPC -In use till 2012 -Code assignment by EPA examiners
USPC	United States Patent Classification	US	1831	~150,000	-U.S. national classification system -In use till 2012 -Code assignment by an external agency (by the examiner on filing)
CPC	Cooperative Patent Classification	Europe US	2013	~250,000	-Classification system for the US and EU -ECLA (90%) + USPC (10%) (BM field, etc.)

and representative drawing of the patent bibliographic data, which serve as the basis for investigating prior arts such a measure would greatly contribute to the actual disclosure of invention in the patent literature.

Conclusion

In this study, example cases of the attempts of some corporations to delay public recognition and use of their patent technologies that are disclosed in their patent application documents, abusing the loophole of the patent law. They employ stalling strategies when drafting patent application documents, to prevent their patent technologies from being shortlisted by patent search engines, under the assumption that such manipulations of wordings and arrangements of core technologies would make it difficult for patent analysts to recognize them, especially due to the current trend of rapid growth in the amount of patent bibliographic data.

Such strategies are seen as devious attempts of some companies to maintain competitive advantage by keeping their knowledge and R&D results from being exposed to competitors. They demonstrate the negative impact of excessive protective measures undertaken within the margin allowed by the patent law on the genuine function of the patent law, which requires improvement. While it is true that the knowledge protection provided by a patent is limited to the content specified in patent application documents[10] such stalling strategies impeding the recognition and use of patent technologies with the intent to protect corporate knowledge and R&D achievements and maintain monopoly profits are deemed the product of corporate egoism running counter to entrepreneurial ethics that contribute to industrial development.

By looking into the patent application documents of the example companies herein, this study identified stalling strategies employed when drafting the abstract and title, arranging the representative drawing, drafting the detailed description and arranging drawings, drafting and arranging claims, and undertaking divisional applications. Furthermore, it explored measures to counteract such stalling strategies and presented countermeasures depending upon the purpose of patent literature search and use, and discussed institutional improvement measures. Patent analysts are recommended to use patent bibliographic data more efficiently, bearing the results of this study in mind, thus enhancing the chances of recognizing the camouflaged core technologies and adjusting search scope according to the purpose of search. Presently, it is considered recommendable to establish a search formula by combining the

keywords, classification codes, and core patent applicants and extend the search of drawings beyond the representative drawing. The same applies to claims: instead of only Claim 1, all independent claims will have to be examined, one a patent is filtered in the core patent mining. Furthermore, it is desirable to supplement the patent law by establishing an institutional measure to make the clear and accurate disclosure of the patent technology mandatory in the title, abstract, and representative drawing, which may be used for stalling strategies, as well as accurate patent classification to ensure actual disclosure in patent application documents.

References

1 Oh J & Choo K, An empirical study on the patent examination and re-examination request: The case of 'ex-parte' re-examinations, *Journal of Industrial Organization*, 20 (2) (2012) 5-36.

2 Fabry B, Ernst H, Langholz J & Köster M, Patent portfolio analysis as a useful tool for identifying R&D and business opportunities-an empirical application in the nutrition and health industry, *World Patent Information*, 28 (3) (2006) 215-225.

3 Hall B H & Ziedonis R H. The patent paradox revisited: An empirical study of patenting in the U.S. semiconductor industry, *The RAND Journal of Economics*, 32 (2001) 101-128.

4 Bosch de V, Volberda F A J & Boer de H W, Coevolution of firm absorptive capacity and knowledge environment: Organizational forms and combinative capabilities, *Organization Science*, 10 (1999) 551-568.

5 Spender J C, Robert M & Grant R M, Knowledge and the firm: Overview, *Strategic Management Journal*, 17 (1996) 5-9.

6 Liebeskind J P, Knowledge, strategy, and the theory of the firm, *Strategic Management Journal*, 17 (1996) 93-107.

7 Grant R M, Toward a knowledge-based theory of the firm, *Strategic Management Journal*, 17 (1996) 109-122.

8 Anton J J & Yao D A, Little patents and big secrets: Managing intellectual property, *The RAND Journal of Economics*, 35 (2004) 1-22.

9 Mansfield E, Patents and innovation: An empirical study, *Management Science*, 32 (2) (1986) 173-181.

10 Schankerman M, How valuable is patent protection? Estimates by technology field, *The RAND Journal of Economics*, 29 (1998) 77-107

11 Nasibah R & Zinatual A, Intellectual property ownership model in academia: An analysis, *Journal of Intellectual Property Rights*,19 (2014) 177-188.

12 Regibeau P & Rockett K, Innovation cycles and learning at the Patent Office: Does the early patent get the delay? *Journal of Industrial Economics*, 58 (2) (2010) 222-246.

13 Cockburn I M, Kortum S & Stern S, Are all Patent Examiners equal? Examiners, patent characteristics, and litigation outcomes, *Patents in the Knowledge-Based Economy*, 2003, 120-148.

14 King J L, Patent examination procedures as inputs to patent quality, Patents in the knowledge-based economy, Cohen W M, Merrill S A & Washington D C, *National Academy Press* (2003) 54-73.

15 Popp D, Juhl T & Johnson D K N, Time In purgatory: Examining the grant lag for U.S. patent applications, *B. E. Journal of Economic Analysis & Policy*, 4 (1) (2004) 28-31.

16 Harhoff D & Wagner S, Modeling the duration of patent examination at the European Patent Office, *Management Science*, 55 (12) (2009) 1969-1984.

17 Henkel J & Jell F, Patent pending – Why faster isn't always better, *SSRN Discussion Paper*, http://ssrn.com/abstract=1738912.

18 Liebesney F *et al.*, The scientific and technical information contained in patent specifications, *The Information Scientist*, 1974, 165-177.

19 Terapane John F, A unique source of information, *Chemtech*, 8 (1978) 272.

20 Chin-Lung L *et al.*, Business strategies in intellectual property rights:An example of patent disputes solutions in the Taiwan high-tech industry, *Journal of Intellectual Property Rights*, 19 (2014) 413-422.

21 Johnson D K N & D Popp, Forced out of the closet: The Impact of the American Inventors Protection Act on the timing of patent disclosure, *RAND Journal of Economics*, 34 (1) (2003) 96-112.

22 Moser P, How do patent laws influence innovation? Evidence from nineteenth-century world's fairs, *The American Economic Review*, 95 (1986) 1214-1236.