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Patent Valuation: Aren't We Forgetting Something? Making the Case for Claims Analysis in Patent Valuation by Proposing a Patent Valuation Method and a Patent-Specific Discount Rate Using the CAPM

By Malcolm T. "Ty" Meeks & Charles A. Eldering, PhD[1]

I. INTRODUCTION

¶1 As the U.S. economy transitions from a manufacturing-based economy to a more "knowledge-based" economy, the importance and value of intangible assets to U.S. businesses and investors has increased.[2] Some have asserted that currently over half of the value of publicly listed companies stems from their intangible assets.[3] As this trend continues, so too, will the continued importance and value of intangible assets to the U.S. economy. Patents, arguably, constitute the most important of these intangible assets because of the exclusionary rights they provide to their owners and because of the monetary impact they can have via damages from patent infringement cases and licensing royalties.

¶2 As a result of the increased economic power of patents, some investors and companies have come to view patents as economic assets, per se, and have sought to take advantage of the pent-up value they possess by buying and selling patents and seeking to

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[2] *See, e.g.*, MARGARET M. BLAIR & STEVEN M. H. WALLMAN, UNSEEN WEALTH, REPORT OF THE BROOKINGS TASK FORCE ON INTANGIBLES (2001). *See also* IBM CORPORATION, BUILDING A NEW IP MARKETPLACE: IBM GLOBAL INNOVATION OUTLOOK 2.0 REPORT (2006), *available at* http://www.ibm.com/ibm/governmentalprograms/ipbooklet.pdf; Baruch Lev, *Sharpening the Intangibles Edge*, HARV. BUS. REV., June 2004, at 109.

[3] *See, e.g.*, PRICEWATERHOUSECOOPERS, TECHNOLOGY EXECUTIVE CONNECTIONS: EXPLOITING INTELLECTUAL PROPERTY IN A COMPLEX WORLD 9 (2007), *available at* http://www.pwc.com/en_GX/gx/technology/pdf/exploiting-intellectual-property.pdf. *See also* Lev, *supra* note 2, at 110 ("[T]he share prices of intangibles-intensive companies command a large premium over book value, reflecting an apparent recognition by investors of intangibles' value.").

monetize them in a variety of ways.[4] Historically, patents were viewed purely as legal instruments whose values were derived primarily from their defensive use. Specifically, a patent's value historically was limited to either (1) protecting revenues associated with a patent-protected product sold by the patent owner by putting a "moat" around the product, (2) serving as a signaling mechanism to the market regarding a company's level of innovation, i.e., the larger the patent portfolio, the more innovative the company, or (3) serving as a deterrent to competitors contemplating filing patent infringement suits as a form of a "stand still" agreement, i.e., "don't sue me for patent infringement and I won't counter-sue you for patent infringement." In particular, the "stand still" concept led to a tremendous boom in patenting over the last ten years, particularly among high technology companies.[5]

¶3 This Cold War-like arms race left many technology companies with vast patent portfolios consisting of patents covering products that the companies either no longer sell or never sold in the first instance. Further, Generally Accepted Accounting Principles (GAAP) rules forbid these companies from booking patents generated internally on their balance sheets as assets.[6] Consequently, despite having value, the patent's worth does not find its way to the balance sheet. As a result, a movement has begun among companies to monetize patents via licensing programs, litigation, or outright sale, in hopes of extracting and realizing the pent-up value patents possess. For example, Hewlett-Packard recently began selling patents on its website.[7]

¶4 This monetization movement has spawned a burgeoning secondary market for patents. Although the market is still in its infancy, The Economist magazine estimates that this secondary market is expected to grow by 20 percent to 30 percent in the foreseeable future.[8] Despite enjoying this projected growth, the market also suffers from a serious hindrance: valuation.[9]

¶5 No agreed-upon patent valuation technique currently exists. Consequently, despite the fact that patent-based transactions do in fact take place, the market remains largely

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[4] *See, e.g.*, PRICEWATERHOUSECOOPERS, *supra* note 3, at 63 (reporting that 55% of executives of global technology companies responding to a survey expect their companies to increase their licensing activities, i.e., licensing their technology to others, over the next three to five years as a means to capitalize on their patents).

[5] ARON LEVKO ET AL., PRICEWATERHOUSECOOPERS, A CLOSER LOOK: PATENT LITIGATION TRENDS AND THE INCREASING IMPORTANCE OF NONPRACTICING ENTITIES 1 (2009), *available at* http://www.pwc.com/en_US/us/forensic-services/publications/assets/2009-patent-litigation-study.pdf.

[6] *See* FINANCIAL ACCOUNTING STANDARDS BOARD, ACCOUNTING STANDARDS CODIFICATION § 350-30-25-3 ("Costs of internally developing, maintaining, or restoring intangible assets that are not specifically identifiable, that have indeterminate lives, or are inherent in a continuing business and related to an entity as a whole, *shall be recognized as an expense when incurred*.") (emphasis added). *See also* GUIDEBOOK: GOODWILL AND OTHER INTANGIBLE ASSETS, 2003 SEC-GAAP ¶ 590, SFAS No. 142 (June 2001) (There are three criteria for capitalization of goodwill and intangible assets, which include patents, as an asset. Internally-generated goodwill or an internally-generated intangible asset, including a patent, "would fail to meet all three of these conditions because it is not specifically identifiable, it lacks a determinable life and it is inherent to a going concern. *Therefore, the costs associated with the creation of goodwill may not be capitalized as an asset.*") (emphasis added).

[7] *HP Intellectual Property Licensing*, HEWLETT PACKARD, http://h20229.www2.hp.com/hpvps/OnlinePatentSales.html (last visited Nov. 30, 2010).

[8] *Trolls Demanding Tolls*, THE ECONOMIST, Sept. 12, 2009, at 84, *available at* http://www.economist.com/businessfinance/displayStory.cfm?story_id=14416641.

[9] Ashby H. B. Monk, *The Emerging Market for Intellectual Property: Drivers, Restrainers, and Implications*, 9 J. ECON. GEOGRAPHY 469, 478–79 (2009).

inefficient, illiquid, and opaque.[10] Recognizing this fact, experts have suggested a variety of valuation techniques, including real options methods, cost-based methods, market-based methods, and more quantitative methods, including counting the number of citations a patent receives, calculating renewal fee payment information, counting the number of claims a patent has, and determining a patent's age.[11] Surprisingly, none of these measures mentions an analysis of the most important part of a patent—its claims. In fact, ostensibly, it appears that much of the literature seeks to develop methods that allow one to completely skip this all-important analysis. Ironically, if you asked patent professionals to determine the strength of a patent without conducting a claims analysis, you would get many a puzzled look.

¶6 Proper valuation of a patent requires the combination of three specialized disciplines: patent law, technology, and finance. This article suggests a patent valuation methodology steeped in all three, with a particular focus on patent claim analysis, and includes a case study to exemplify application of the methodology. Further, nothing in the literature provides a suggested discount rate for patent-specific revenues. Therefore, the article also attempts to determine an appropriate discount rate for patents, per se, based on publicly available information and the capital asset pricing model. The article also provides details on valuation methods currently suggested by the literature and explains why they are inadequate. Finally, the article examines how valuation is currently conducted in practice based on off-the-record interviews with in-house patent lawyers at national and international technology companies, a founder of a patent analytics firm, and a prominent patent damages expert witness.

¶7 A further note regarding the content of this article and the target audiences it addresses: The word "audiences" is plural because the article attempts to bridge a gap between two groups of professionals who, to this point, have rarely interacted—namely, patent professionals and finance professionals. Both, however, possess the skills necessary to properly value patents. Historically speaking, however, neither possesses much knowledge regarding each counterpart's area of expertise. Thus, this article speaks to both groups in an attempt to explain the basics, so to speak, regarding both patent law and finance.[12] Consequently, the patent practitioner may find the first half of this document elementary but may find insights gained on financial theory and the capital asset pricing model ("CAPM") discussed in the second half of the article to be beneficial. Conversely, the finance professional well versed in finance theory may find the latter half of the article very basic but should gain a better understanding regarding patents and patent law upon reading and digesting the first half of the article.

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[10] *Id.* at 478–81. *See also* Mark A. Lemley & Nathan Myhrvold, *How to Make a Patent Market*, 36 HOFSTRA L. REV. 257 (2007) (stating that even if a patent has been licensed many times the terms are confidential so that the market cannot ascertain the true or comparable value).

[11] *See* discussion *infra* Part IV.

[12] Of the three areas necessary for proper patent valuation (patent law, technology, and finance), both patent professionals and finance professionals interact with technology professionals. Indeed, most patent attorneys have a technical or engineering background and deal with inventors and technical experts on a daily basis. Similarly, many finance professionals who cover the technology industry, i.e., Wall Street analysts and technology investment bankers, gain an understanding of the technologies they cover and interact with technology professionals as well. Consequently, the larger gap exists between patent professionals and finance professionals. For a comprehensive valuation technique to evolve, we must work to close this gap.

II. SUMMARY OF THE PROPOSED METHODOLOGY

¶8 A patent grants the owner the right to exclude others from making, using, offering for sale, or selling the claimed invention.[13] Thus, a patent does not grant the right or obligation to do anything. Instead, it grants a negative right to exclude others from performing the claimed invention. As discussed in more detail below, all patents include claims, i.e., numbered paragraphs at the end of the written description, which describe the boundary of the exclusionary rights. Consequently, the value of a patent ultimately stems from the ability to legally prevent an entity from performing a function, such as making, using, or selling a product, covered by at least one claim of the patent. The more valuable the activity is, the higher the cost of exclusion, and thus, the more valuable the patent.

¶9 To determine the value of a patent, one must determine (1) the scope of the patent's claims; (2) the products or services covered by the patent's claims; and (3) the economic benefit associated with the product or service. Taken to the logical conclusion, the U.S. court system serves at the "last resort" forum for answering these questions via patent litigation actions. In litigation, the court will look to the claims to first determine their scope,[14] and then apply the claims to the accused product to determine if the claims cover the product.[15] If the accused product comes within the scope of the claims, patent infringement exists and the court or jury then determines the appropriate amount of damages due to the patent owner.[16] The method proposed by this article draws on these realities in attempting to determine an accurate valuation for patents.

¶10 Based on the above, the proposed method includes the following steps:

(1) Determine the scope of the patent claims;
(2) Determine which products (if any) fall within the scope of the claims;
(3) Determine the appropriate royalty rate;
(4) Determine the revenues associated with the covered product(s);
(5) Determine future cash flows associated with the royalty base;
(6) Adjust expected returns based on idiosyncratic risk; and
(7) Discount the adjusted expected returns using an appropriate discount rate.

This methodology works best in a particular scenario. Specifically, it works best in a setting in which a patent currently generates no licensing revenue and covers no product currently marketed or sold by the patent owner. Even though the patent generates no revenue and does not protect a currently marketed product, others in the subject industry may employ the patented technology in their products or services. Therein lies the value in the otherwise dormant patent asset.

¶11 Further, as a corollary to this, the methodology works best in the technology/software/IT industries where products continue to incorporate ever-increasing

[13] 35 U.S.C. § 271(a) (2006) ("[W]hoever without authority makes, uses, offers to sell, or sells any patented invention, within the United States or imports into the United States any patented invention during the term of the patent therefor, infringes the patent.").

[14] *See* Markman v. Westview Instruments, Inc., 517 U.S. 370, 384 (1996).

[15] *See* Vulcan Eng'g Co. v. Fata Aluminium, Inc., 278 F.3d 1366, 1373 (Fed. Cir. 2002).

[16] *See* Lucent Techs., Inc. v. Gateway, Inc., 580 F.3d 1301, 1324 (Fed. Cir. 2009).

patent-protected features. Some refer to this reality as the "patent thicket"[17] issue, in that a single technology product may incorporate hundreds of patented technologies. This phenomenon exists most commonly in this technology area (e.g., as opposed to the biotechnology or pharmaceutical areas) largely because of the convergence of technologies (e.g. video, mobile devices, broadband connectivity) and decreasing device form factors, which has lead to the merger of multiple functionalities into single devices. For example, the mobile phone you used ten years ago most likely included a small amount of memory, a number pad, and a simple backlit display. The mobile phone you likely use now includes a high-resolution color display, a QWERTY keyboard or touch screen, a camera (including a lens and flash), the ability to send and receive e-mail and text messages, the ability to surf the Internet, a flash memory slot, the ability to record and play video, an MP-3 player, and a GPS system, for example. Each of these technologies has patents associated with it and all, theoretically, would now apply to the single device.

¶12 This methodology also uses patent litigation as the backdrop for the valuation determination. Despite the movement to treat patents as financial assets (which is correct, in the authors' view), patents remain, at their core, a bundle of legal rights. Thus, in the event two parties cannot agree on a licensing arrangement, for example, the patent owner has the option to file suit for patent infringement, and the courts will determine whether infringement exists and, if so, the level of damages resulting from the infringement. As a result, licensing negotiations essentially become "mini" patent trials, in that the patent owner typically presents a claim chart demonstrating how the potential licensee's products infringe the claims of its patent. If a potential licensee (after analyzing the patent claims and its products) does not believe its products infringe the patent, it will refuse the license. Once the potential licensee refuses the license, if the patent owner continues to believe the potential licensee needs to take a license, the patent owner will file suit and the court will ultimately decide whether the products infringe the patent and if so, what damages are due to the patent owner. Consequently, the methodology uses litigation as a backdrop for the valuation process.

III. THE IMPORTANCE OF PATENT CLAIMS

¶13 As described above, a patent constitutes a negative right in that it gives the owner no right or obligation to do anything, only to *exclude* others from performing the *claimed* invention.[18] Consequently, when you read a news story in the business press regarding one company "losing a patent case" or that a court found that company's product "infringed the patent of a competitor company," what has really occurred is that a

[17] Some use this phrase to refer to the belief that the U.S. Patent Office has granted redundant patents, i.e., that it has granted multiple patents covering identical portions of identical technologies. *See, e.g.*, Sannu K. Shrestha, *Trolls or Market-Makers? An Empirical Analysis of Nonpracticing Entities*, 110 COLUM. L. REV. 114, 124–25 (2010). While empirical evidence on this point remains scant, the reality most likely includes a combination of this belief with the technology conversion phenomenon discussed within the body of this article.

[18] TransCore, LP v. Elec. Transactions Consultants Corp., 563 F.3d 1271, 1275 (Fed. Cir. 2009) ("[T]he grant of a patent does not provide the [patent owner] with and affirmative right to practice the patent but merely the right to exclude.").

company's product or service infringed at least one claim of the victorious company's patent. Therefore, the real strength of a patent lies in its claims.

¶14 Indeed, the long-established practice in patent law regarding the strength of a patent requires one to look first to the patent claims, which actually define the invention. In fact the Court of Appeals for the Federal Circuit,[19] the appellate court located in Washington, DC established specifically to hear all appeals of cases involving patent law, has stated:

> A claim is a group of words defining only the *boundary* of the patent monopoly. The Supreme Court has likened patent claims to the description of real property in a deed which sets the bounds to the grant which it contains. It is to the claims of every patent, therefore, that we must turn when we are seeking to *determine what the intention is* . . . .[20]

Consequently, when determining value, one must analyze the claims of a patent because "[i]t is the claims that define the metes and bounds of the patentee's invention [and] define the scope of patent protection."[21]

A. What are Patent Claims?

¶15 According to the Patent Act, every patent must include a narrative portion describing the invention and must "conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention."[22] Thus, opening a patent and turning toward the rear of the document, one will notice numbered paragraphs after a statement such as "I claim" or "We claim." These numbered paragraphs constitute the patent's claims. The claims will include at least one independent claim (Claim 1 is always independent). A patent may also include other claims that depend on Claim 1 ("dependent claims") and/or other independent claims (and they, in turn, may have other dependent claims).[23] Independent claims include a preamble (set apart by a colon), which provides context for the invention. They also include a series of "elements" or "limitations,"[24] typically set apart by semicolons. For example, see a typical claim format below with the preamble and claim limitations identified as such:

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[19] Patent infringement constitutes a federal question; thus, all patent infringement cases must be filed in federal district courts. 28 U.S.C. § 1338(a) (2006). *See also* Air Measurement Techs., Inc. v. Akin Gump Strauss Hauer & Feld, L.L.P., 504 F.3d 1262, 1269 (Fed. Cir. 2007). Unlike other federal appeals courts, who are bound in their jurisdiction by geography under 28 U.S.C. § 1294(1) (2006), the Court of Appeals for the Federal Circuit ("Federal Circuit") hears all patent appeals, regardless of where they originate in the country. 28 U.S.C. § 1295(a)(1) (2006). A party unhappy with the Federal Circuit's decision may request that the Supreme Court hear the case, but the Supreme Court is under no obligation to take the case. 28 U.S.C. § 1254. As a result, and because the Supreme Court, historically, has taken so few patent appeals cases, some refer to the Federal Circuit as the "Patent Supreme Court."

[20] Gen. Foods Corp. v. Studiengesellschaft Kohle mbH, 972 F.2d 1272, 1274 (Fed. Cir. 1992) (internal citations and quotations omitted).

[21] Kara Tech. Inc. v. Stamps.com Inc., 582 F.3d 1341, 1347–48 (Fed. Cir. 2009) (citations omitted).

[22] 35 U.S.C. § 112 ¶ 2 (2006).

[23] *Id.* § 112 ¶ 3.

[24] Practitioners use the terms "elements" and "limitations" interchangeably when discussing claims.

TYPICAL INDEPENDENT CLAIM STRUCTURE.[25]

Typical Independent Claim Structure	
Preamble	**14.** A method for producing a first map of metacodes and their addresses of use in association with mapped content and stored in distinct map storage means, the method comprising:
First Element	providing the mapped content to mapped content storage means;
Second Element	providing a menu of metacodes;
Third Element	compiling a map of the metacodes in the distinct storage means, by locating, detecting, and addressing the metacodes; and
Fourth Element	providing the document as the content of the document and the metacode map of the document.

As discussed above, a patent may include dependent claims as well. These dependent claims must identify the claim, by number, on which they depend. Under the law, dependent claims incorporate all limitations of the claims on which they depend.[26] See below the format for a dependent claim:

TYPICAL DEPENDANT CLAIM STRUCTURE.[27]

Typical Dependant Claim Structure	
Dependent Claim Element	**18.** A method as claimed in claim **14** further comprising comparing the multiplicity of metacodes in the map with a predetermined set of criteria.

Since dependent claims incorporate all limitations of the claims on which they depend, if a product or service infringes a dependent claim, it also, by definition, infringes the independent claim. Therefore, henceforth when discussing claims, this article will focus on independent claims.

B. The Role of Patent Claims in Establishing Patent Value

¶16 As discussed above, a patent's claims define the bounds of the technological subject matter it covers, thus, the value of a patent coincides with the value of the

[25] U.S. Patent No. 5,787,449 (filed June 2, 1994).

[26] 35 U.S.C. § 112 ¶ 4 ("[A] claim in dependent form shall contain a reference to a claim previously set forth and then specify a further limitation of the subject matter claimed. A claim in dependent form shall be construed to incorporate by reference all the limitations of the claim to which it refers.").

[27] U.S. Patent No. 5,787,449 (filed June 2, 1994).

technology covered. In other words, the value of a patent coincides with the value of products or services that infringe the patent claims. In order to infringe a patent, a product or service must include *each and every element* of the claims.[28] Therefore, an accused infringer or potential licensee need only show that its product lacks *a single element* of an asserted claim in order to absolve itself of infringement, and, by extension, the potential need to pay licensing royalties. For example, if a claim has five elements, and an accused product has four of the five elements, the accused product *does not* infringe the claim. Therefore, a patent owner is not entitled to 80% of damages it would otherwise receive; rather, the owner would receive *no damages*. Under this scenario, the revenue that the patent owner could expect to receive in the form of licensing royalties from the manufacturer of the accused device would amount to zero. Thus, as it pertains to the accused product in question in this example, the patent has a value of zero. This reality exists regardless of the number of citations the patent has received, its relative age, or the cost incurred by obtaining the patent. The breadth of patent claims ultimately supersedes all of these other proxies for patent value.

IV. VALUATION METHODOLOGIES SUGGESTED BY THE LITERATURE

¶17 Although the market has established the need for a viable patent valuation methodology, it has yet to reach a consensus on a preferred valuation model. Much has been written on suggested patent valuation methodologies; however, none include an analysis of patent claims as part of the methodology. Indeed, some do not mention the word "claim" at all. It appears, in fact, that the primary goal of these suggested methodologies would have one avoid the claim analysis portion completely and rely solely on objective, quantitative measures as a proxy for patent value. One can divide the valuation methodologies into two camps, one focused primarily on financial techniques and the other focused primarily on legal issues. This section provides a brief survey of each.

A. Financial Methodologies

1. Options Pricing Theories

¶18 A vastly popular patent valuation technique among those with economic or financial backgrounds constitutes using a modified Black-Sholes method of options pricing.[29] Many view patents as a real option granting the patent holder the right, but not the obligation, to manufacture a product covered by the patent or to proceed with the

[28] BMC Res., Inc. v. Paymentech, L.P., 498 F.3d 1373, 1378–79 (Fed. Cir. 2007) ("[I]nfringement requires a party to perform or use each and every step or element of a claimed method or product.").

[29] *See, e.g.*, Robert Pitkethly, *The Valuation of Patents: A Review of Patent Valuation Methods with Considerations of Option Based Methods and the Potential for Further Research*, OXFORD INTELL. PROP. RES. CENTRE DISCUSSION PAPER SERIES (1997), *available at* http://www.oiprc.ox.ac.uk/EJWP0599.pdf; Nicholas Bloom & John Van Reenen, *Patents, Real Options, and Firm Performance*, 112 ECON. J. C97, C99-103 (2002); Ming-Cheng Wu & Chun-Yao Tseng, *Valuation of Patent – A Real Options Perspective*, 13 APPLIED ECON. LETTERS 313 (2006); Rujing Meng, *A Patent Race in a Real Options Setting: Investment Strategy, Valuation, CAPM Beta, and Return Volatility*, 32 J. ECON. DYNAMICS & CONTROL 3192 (2008); Prahlad Rao Laxman & Sandeep Aggarwal, *Patent Valuation Using Real Options*, IIMB MGMT. REV., Dec. 2003, at 44.

costs of procuring a patent in view of expected future benefits. Recall, however, as discussed in Part II above, that a patent does not, in fact, grant the owner a right or obligation to perform the invention. Further, this "real option" approach proves problematic in implementation, because one of the key inputs, the volatility (standard deviation) in value of the underlying asset, does not exist for patents, *per se*.[30] Patents do not trade on an exchange, and the terms of many patent sale and licensing agreements remain confidential, so obtaining this variability term remains elusive. Some use the variability of the stock price of the patent owner's firm,[31] but a company's stock price, as a whole, contains much more information than that solely related to its patents. Further, the real option approach provides little guidance for existing patents covering products no longer manufactured by the patent owner. As discussed in the introduction, many patent owners face this issue, particularly in the electronic technology space.

2. Market and Cost Theories

¶19 Still others use the familiar market and cost theories to attempt to assign value to patents.[32] The market theory attempts to observe patent value by identifying values of comparable patents sold or licensed in the marketplace. This bears similarities to a Multiple Listing Service (MLS) for real estate transactions.[33] In theory, this method should provide guidance, and perhaps an MLS-type listing will exist for patents at some future juncture. However, because of confidentiality surrounding the majority of patent transactions, the market approach currently bears little fruit.

¶20 The cost approach attempts to assign value to a patent based on the costs of procuring the patent asset, i.e., filing fees, attorney costs, etc.[34] This method does not, however, account for any future benefits the patent may bring to the patent owner (in the form of licensing revenues, for example).

3. Discounted Cash Flow Methods

¶21 If a patent currently generates cash, in the form of licensing revenue, for example, some apply familiar discounted cash flow methodologies to those flows to arrive at a patent value.[35] Of the suggested financial methods, this method seems the most sound. To implement it, one must determine (1) the future cash flows generated by the patent in

[30] Sander van Triest & Wim Vis, *Valuing Patents on Cost-Reducing Technology: A Case Study*, 105 INT'L J. PRODUCTION ECON. 282, 284 (2007) (stating that the lack of market-based estimates of volatility "makes an option-based approach to valuing patents difficult"). *See also* F. Russell Denton & Paul J. Heald, *Random Walks, Non-Cooperative Games, and the Complex Mathematics of Patent Pricing*, 55 RUTGERS L. REV. 1175, 1203 (2003) (identifying seven challenges to adapting Black-Scholes to patents including the lack of variability information).

[31] Wu & Tseng, *supra* note 29, at 316 (suggesting use of the stock price of the patent owner firm as a proxy for patent volatility in a real options setting).

[32] Scot A. Reader, *A Computer-Friendly Microeconomic Patent Portfolio Valuation Algorithm*, THE LICENSING J., Nov.–Dec. 2001, at 14.

[33] A Multiple Listing Service is a system established by real estate brokers to disclose and exchange relevant information regarding real estate transactions. *See, e.g., What is a Multiple Listing Service?*, NAT'L ASS'N OF REALTORS, http://www.realtor.org/law_and_policy/doj/mls_overview (last visited Oct. 29, 2010). No such transparent system currently exists for patent sales or patent licenses.

[34] *See, e.g.*, Pitkethly, *supra* note 29, at 6.

[35] *See* van Triest & Vis, *supra* note 30, at 282.

question and (2) an appropriate discount rate.[36] However, nothing in the literature currently suggests an appropriate discount rate for patents. This article, in association with its suggested valuation method, attempts to arrive at a discount rate for patents, *per se*, in the electrical/electronic technology space.

B. Legal Methodologies

1. Characteristics of Litigated Patents

¶22 Some commentators have used characteristics of litigated patents as a proxy for patent value. They base their logic for this proxy on the assumption that companies will only expend resources to enforce a patent if it is, in fact, valuable.[37] The authors of an article proposing this theory examined characteristics of litigated patents and gleaned what they believe constitute characteristics of valuable patents, including the following findings: valuable patents are typically young, owned by domestic companies, cite more prior art on average, receive more citations than average, and spend more time in prosecution than average.[38]

¶23 While these characteristics may prove noteworthy as a starting point in situations, for example, where a company has a large patent portfolio and seeks a method to "whittle down" the large number to a more manageable size, this still constitutes no substitute for claim analysis. In addition, factors other than value (for example, domestic companies may be more willing to sue than foreign companies based on home-bias fears) may skew some of the data. Further, the strongest, and consequently the most valuable, patents may never be litigated precisely because of their strength. Rational licensees would recognize this strength and deem it more cost effective to license than to litigate. Therefore, the strongest patents are less likely to make it into the litigation data pool. In contrast, patents with value just below the strongest of patents may find themselves in litigation more often. Consequently, the result of the research may not provide information on the most valuable patents (because those are so strong that they don't require litigation). Rather, the result may actually reveal characteristics of patents a tier below the most valuable patents. The authors acknowledge these possibilities, however.[39]

2. Patent Citations

¶24 The cover page of a patent includes citations to other patents deemed relevant to the underlying patent. The patents cited on the cover of a patent are referred to as "backward citations." In contrast, when a patent is cited by another patent, and appears on the cover page of that patent, the cited patent is considered to have received a "forward citation." The number of backward citations a patent cites does not change over time, but the number of forward citations a patent receives may increase over time. Consequently, some commentators have posited that if a large number of subsequently issued patents cite to a particular patent (thus giving it a high number of forward cites), it must be

[36] Pitkethly, *supra* note 29, at 8–9.
[37] John R. Allison, et al., *Valuable Patents*, 92 GEO. L.J. 435, 437 (2004).
[38] *Id.* at 438–39.
[39] *See id.* at 442.

valuable to the associated industry,[40] so commentators have offered patent citation information as a proxy for patent value.[41]

¶25 The mere fact that a patent contains and receives many citations may mean that it has a thorough *disclosure*, but not that it has broad and well-supported *claims*. For example, a patent can describe both the current state of the art and the invention in wonderful detail but possess extremely narrow claims.[42] This constitutes the classic case of "disclosed-but-not-claimed."

¶26 This disclosed-but-not-claimed error can result from either faulty prosecution or more likely because other prior references already teach the broad invention. As such, an elegant recitation of a previously claimed invention in a disclosure may cause patent examiners to heavily cite that patent in future cases in that area of technology. In the authors' experiences, patent examiners frequently cite the same reference against future filings in a particular technology space because of their familiarity with and fondness for the reference, which they come to know either based on their own searching or from a suggestion by their colleagues working within the same technological area. As such, a patent which clearly teaches subject matter in a specific space may indeed become very heavily cited, for reasons completely unrelated to the claims of the patent.

3. Patent Maintenance Fee Renewal Data

¶27 The U.S. Patent Office requires periodic payment of maintenance fees in order to keep a patent in force.[43] Commentators have used this as a proxy for value in that those patents deemed of lesser value. According to the commentators, patents of lesser value will not have their maintenance fees paid.[44] Thus, as posited by these commentators, characteristics of such patents may allow one to determine patent value.[45] While certainly true that rational patent owners would not fail to pay maintenance fees for truly valuable patents, it does not hold that they fail to pay maintenance fees on patents with little value. Companies could pay (or fail to pay) such fees for a number of reasons (a matter of procedure, oversight, etc.). Again, one should not make valuation decisions based on such data absent analyzing a patent's claims.

V. PATENT VALUATION IN PRACTICE

¶28 To ascertain how patent valuation currently manifests itself in practice, the authors conducted off-the-record interviews with in-house patent attorneys at national and international technology firms with significant patent portfolios. The authors also spoke

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[40] Wu & Tseng, *supra* note 29, at 315–16 (stating that patent citations form the most reliable proxy for patent value).

[41] *Id.*

[42] According to § 112 ¶ 1 of the Patent Act, a patent must include a written description, which is a narrative portion, describing the "process of making and using" the invention in "full, clear, concise, and exact terms." 35 U.S.C. § 112 ¶ 1 (2006). The written description, however, does not define the bounds of patent protection. The claims do. *See supra* Part III.A. Thus, a situation can arise in which a patent has a very detailed and broad description of the invention in the written description, but it possesses claims covering only a narrow portion of the invention as described in the written description.

[43] 35 U.S.C. § 41(b).

[44] Kimberly A. Moore, *Worthless Patents*, 20 BERKELEY TECH. L.J. 1521, 1525–26 (2005).

[45] *Id.*

with a prominent patent damages expert and a co-founder of an intellectual property analytics company.

¶29 The prevailing sentiment among the in-house patent attorneys is that "rule of thumb" practices enter many facets of the patent valuation context.[46] Depending on the type of transaction, time constraints, and the identity of a potential buyer, the focus on patent claim analysis can vary a great deal.[47] Virtually all interviewees lamented the fact that no coherent valuation technique exists. One stated that he was recently tasked with valuing a number of his company's patents but at the time did not know where to begin.[48] All, however, believed that the only true measure of a patent's value comes only after analyzing a patent's claims.

¶30 Interestingly, the co-founder of an intellectual property analytics company shared this same view. He suggested that one can employ highly quantitative measures coupled with sophisticated algorithms to develop proxies for value.[49] In this vein, one can employ these sophisticated algorithms as a time and cost saving measure by, for example, filtering a group of 400 relevant patents to 40. Once the patents are filtered, "experts" in patent law and the underlying technology should perform a deeper analysis of the subset of identified patents, which includes a detailed claim analysis.[50] Thus, contrary to what one might expect, this individual did not view the methodology described in this article and the work performed by his company as mutually exclusive, in fact, he believed they can and should co-exist (until technology advances to the point that one can create algorithms that can analyze the breadth of patent claims).[51]

¶31 Practitioners utilize rule of thumb approaches to determine discount rates as well. One practitioner stated that discount rates, and associated adjustments, typically arise arbitrarily among negotiating parties, and eventually the parties agree upon a number.[52] These rates can range up to 40%, for example, and are based largely on intuition by the parties involved in a transaction.[53] According to another practitioner, as brokers have done an increasing number of deals, some increasingly rely on their databases to set proposed prices for patents based on (1) the technology area and (2) the mean value of patent prices in that technology area.[54] This general guideline-type price setting occurs prior to any claim analysis, and can, for better or worse, serve as an anchoring number in negotiations.[55]

¶32 Despite the importance of claim analysis in the patent valuation context, the level of such analysis varies based on a number of factors. Specifically, in the mergers and acquisitions context involving hundreds, if not thousands, of patents and a time constraint of two to three weeks to conduct due diligence, thorough claim analysis proves virtually impossible. In fact, some in-house counsel report enlisting teams of outside lawyers in an

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[46] Interview with In-House Patent Counsel, Silicon Valley Technology Company (December 2009); Interview with In-House Patent Counsel, Semiconductor Company (September 2009).
[47] Interview with In-House Patent Counsel, Silicon Valley Technology Company (December 2009).
[48] Interview with In-House Patent Counsel, Global Energy Company (September 2009).
[49] Interview with Co-Founder, IP Analytics Company (January 2010).
[50] *Id.*
[51] *Id.*
[52] Interview with In-House Patent Counsel, Silicon Valley Technology Company (December 2009).
[53] *Id.*
[54] Interview with In-House Patent Counsel, Semiconductor Company (September 2009).
[55] *Id.*

attempt to perform this due diligence, only to receive the final report *after* the deal has closed.[56] The inability to quickly and accurately value patents undoubtedly creates a significant challenge for technology-focused firms and those responsible for their patent portfolio management. One practitioner stated that he is fairly confident that no one has solved this problem yet, and he believes that companies essentially trade accuracy for speed in M&A deals involving a relatively large number of patents.[57] Furthermore, the companies' investment bankers and tax advisors have yet to develop a solution either. Rather, they generate a goodwill number and assign the patents in question to that number (along with other goodwill items) absent a specific accounting for patent values.[58] However, as the number of patents in a transaction decreases, the level of patent claim analysis increases.

¶33 Moreover, the potential acquirer has an impact on the level of claim analysis as well. Patent-focused investment firms, which have grown in number in recent years, typically carry out a very thorough claim analysis of the patents they seek to purchase or sell.[59] Further, according to one practitioner, in recent years some patent brokers have started to hire more patent attorneys to conduct claim analysis and now incorporate increasing amounts of this type of analysis into their work.[60]

¶34 In addition, two of the in-house counsel interviewed admitted that their companies did not have detailed patent valuation procedures or guidelines.[61] The one whose company did have such guidelines stated that his in-house colleagues at other technology companies express surprise (and envy) that his company has developed and put these types of procedures in place.[62]

¶35 The damages expert interviewed stated that parties do not think enough about patent claims at the outset. In addition, he identified yet another challenge in the patent valuation context: determining a royalty rate used to establish licensing revenues. The royalty rate problem stems from the fact that most licensing royalty rates remain confidential among transacting parties.[63] Services have developed that attempt to determine royalty rates, using any and all publicly-available information, and to sell this information for a fee.[64] Services such as these, however, have created a "self-fulfilling prophesy" in that the most popular royalty rate for patents in the technology and software area is 5% of sales. Given that this figure is continually cited, it is also continually reported, and thus continually used in the industry.[65] The damages expert suggested that if royalty rates were more widely available, this would aid in determining an appropriate comparable royalty rate based on the technology involved, the type of license agreed upon, and the basis for the royalty calculation (sales, profits, etc.).[66] Until that time, parties should employ a bit more sophistication and consideration of the specific context

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[56] Interview with In-House Patent Counsel, Silicon Valley Technology Company (December 2009).
[57] *Id.*
[58] *Id. See also* Interview with In-House Patent Counsel, Semiconductor Company (September 2009).
[59] Interview with In-House Patent Counsel, Semiconductor Company (September 2009).
[60] *Id.*
[61] *Id. See also* Interview with In-House Patent Counsel, Global Energy Company (September 2009).
[62] Interview with In-House Patent Counsel, Silicon Valley Technology Company (December 2009).
[63] Interview with Patent Damages Expert (February 2010).
[64] *Id.*
[65] *Id.*
[66] *Id.*

when setting a royalty rate (rather than anchoring on 5%). In addition, the damages expert raised a key point about valuation: companies typically do not want to license a single patent. Rather, they typically desire the complete freedom to operate within a technology area. Thus, they seek to license entire portfolios of patents addressing a particular technology area.[67] Consequently, portfolios tend to be more valuable than individual patents.[68] Regardless, this individual also agreed that the true measure of any patent or patent portfolio lies in what the claims of that patent or portfolio cover.

¶36 The market continues to evolve and transactions continue to take place. However, the job of assessing the credibility of a proposal or simply setting an asking price would become much easier and more accurate if a coherent, accurate, and relevant patent valuation methodology emerged.

VI. PROPOSED PATENT VALUATION METHODOLOGY AND CASE STUDY

¶37 This article proposes a patent valuation methodology in an attempt to move the patent valuation discussion forward. While the methodology may not serve as a panacea for all of patent valuation's current ills, i.e., the issue of limited time in an M&A context, it seeks to establish a valuation methodology for determining the true value of a patent. It attempts to do so by relying on both legal and financial principles.

¶38 The method is grounded in, and based on, traditional corporate valuation methodology in that it involves both qualitative and quantitative elements. In the traditional corporate valuation context, one must perform forecasting using qualitative measures and reasoned professional judgment. Specifically, one must determine the target company's competitive advantage, determine the sustainability of this advantage, determine cost and revenue drivers, predict growth rates, predict an appropriate cash flow forecasting time horizon, and estimate the terminal growth rate.[69] These qualitative measures are akin to the claim analysis in the patent valuation context in that claim analysis does not constitute an exact science, by any means. Nevertheless, the law has provided qualitative guidelines that patent practitioners apply daily to determine patent claim scope. Thus, just as we do not run from the qualitative aspects that involve reasoned judgment in the corporate valuation context, we should not turn our backs on the necessity of relying on similar reasoned judgment in the patent valuation context.

¶39 Next, just as in the corporate valuation context, we discount the projected cash flows at an appropriate risk-adjusted discount rate. The proposed methodology attempts to determine an appropriate discount rate for discounting cash flows (projected damages awards or licensing royalties) specific to patents, per se.

¶40 Some items to keep in mind regarding this methodology:

- It seeks to determine the true value of a patent, not a proxy for value;
- It seeks to determine the value of a patent, per se, not that of the underlying technology, R&D project, or patented product;

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[67] *Id.*

[68] *Id.*

[69] *See, e.g.*, TIM KOLLER ET AL., VALUATION: MEASURING AND MANAGING THE VALUE OF COMPANIES Ch. 6, 8 (4th ed. 2005).

- It uses patent litigation as the backdrop for the claim analysis and damages calculation;
- It therefore should constitute a floor, because ultimately, litigation may not prove necessary; and
- It is most appropriate in the technology context, because the discount rate was calculated using comparables of two publicly listed essentially pure-play patent licensing companies, who both happen to operate in the technology space.

To illustrate the point, this section incorporates a case study utilizing the methodology to value a patent. The chosen patent is U.S. Patent No. 5,787,449 assigned to Infrastructures for Information (i4i). The patent has withstood the gauntlet of district court and appellate litigation, which provides a unique view to compare the suggested valuation methodology with the outcome of these proceedings.[70] The case study was conducted, however, by turning a blind eye to the proceedings so as not to taint or skew the analysis in any way. This article includes relevant portions of the case study interspersed within the relevant sections below and includes a detailed claim chart in Appendix B mapping the analyzed claim (claim 14 of the patent) element-by-element to an accused product (Microsoft Word 2007's XML feature).

A. Relying on a Patent Infringement Determination as the Backdrop

¶41 To determine the expected future revenues generated by a patent, one needs to essentially ascertain the scope of any potential infringement by third parties, i.e., potential licensees. To determine the scope of potential infringement, one must essentially perform the steps conducted routinely by patent lawyers as part of a pre-litigation filing due diligence process. That is, determine the scope of the patent's claims[71] and determine the technology covered by the claims. Patent attorneys do not typically conduct this analysis in order to assign a dollar value to patents they analyze; nevertheless, the pre-filing due diligence analysis serves as a key first step in the patent valuation process.

¶42 The infringement analysis consists of a two-part process. First, one must construe the claims to determine their proper meaning.[72] Second, one must apply the properly construed claims to an accused device.[73]

[70] *See* i4i Ltd. P'ship v. Microsoft Corp., 670 F. Supp. 2d 568 (E.D. Tex. 2009); i4i Ltd. P'ship v. Microsoft Corp., 598 F.3d 831 (Fed. Cir. 2010).

[71] As discussed earlier in this article, the analysis can initially be limited to the independent claims, because a dependent claim cannot be infringed if the corresponding independent claim is not infringed.

[72] Markman v. Westview Instruments, Inc., 517 U.S. 370, 384 (1996).

[73] Vulcan Eng'g Co. v. Fata Aluminium, Inc., 278 F.3d 1366, 1373 (Fed. Cir. 2002).

CASE STUDY: U.S. PATENT NO. 5,787,449.

Case Study: U.S. Patent No. 5,787,449 **"Method and System for Manipulating the Architecture and the Content of a Document Separately From Each Other"**
The patent in question relates to the manipulation of content information and formatting information of electronic documents. Specifically, the patent teaches a method for separately storing document content and document formatting (font, headings, etc.) such that an operator may manipulate one without the need to manipulate the other. According to the patent, this serves as an improvement over prior technology which embedded formatting information within the text stream of a document along with the document content. The patent refers to the formatting information as "metacodes." The patent contains 20 claims total, of which three (claims 1, 14, and 20) are independent. The case study analyzes claim 14, a method claim. See Appendix A for the cover page of the patent.

B. Determine the Scope of the Claims

¶43 To determine how broad or narrow a patent's claims are, one must look to the claims themselves, the patent specification (the written narrative portion of the patent), and the prosecution history (the written public record of communications between the patent applicant and the U.S. Patent and Trademark Office during the application process).[74] In determining claim scope, a high-level checklist can be utilized as described below.

CASE STUDY: U.S. PATENT NO. 5,787,449.

Case Study: U.S. Patent No. 5,787,449 **Claim 14**
Claim 14 of the patent reads: **14.** A method for producing a first map of metacodes and their addresses of use in association with mapped content and stored in distinct map storage means, the method comprising: providing the mapped content to mapped content storage means; providing a menu of metacodes; compiling a map of the metacodes in the distinct storage means, by locating, detecting, and addressing the metacodes; and providing the document as the content of the document and the metacode map of the document.

1. Length of the Claim (Number of Limitations)

¶44 The length of the claim, i.e. the more limitations a claim possess, subject to a number of factors related to the technology area and other services, can serve as an initial check on claim scope. Because infringement can only exist where an infringer's product

[74] Phillips v. AWH Corp., 415 F.3d 1303, 1312–17 (Fed. Cir. 2005) (en banc).

meets every limitation of a claim, more limitations increase the likelihood of a potential infringer's product not meeting one of the limitations.

CASE STUDY: U.S. PATENT NO. 5,787,449.

Case Study: U.S. Patent No. 5,787,449
Analysis of Claim 14
Claim 14 has only four limitations, which does not, at first glance, constitute an inordinate number of claim limitations.

2. Open or Closed Transition Language

¶45 As discussed above, a claim typically contains (1) a preamble, providing the context for the claim; (2) a transition term or phrase prior to listing claim elements; and (3) claim elements. For example, in the following sample claim:

> A seat heating apparatus comprising:
> a seat having an interior seat cavity formed therein;
> a switch coupled to a controller;
> said controller coupled to a heating element wherein said heating element responds to signals from said controller; and
> wherein said heating element resides within said interior seat cavity.

"A seat heating apparatus" constitutes the preamble, "comprising" constitutes the transition term, and the remaining language lists the recited claim elements.

¶46 The transitional term, in particular, can either be "open" or "closed." For example, open transition terms allow for infringement to stand if a product includes the recited elements plus additional non-recited elements as well.[75] Consequently, if a claim includes elements A and B, and an accused device includes elements A, B, and C, the accused device will infringe. In contrast, closed transition terms allow infringement to stand if an accused product includes the recited elements and *no other elements*.[76] So, in the above example, the existence of the extra element, C, will render the claims non-infringed with the use of closed transition language. The list below includes examples of open and closed claim language.

[75] *See* ROBERT A. MATTHEWS, JR., ANNOTATED PATENT DIGEST §§ 4:38–57 (2009).
[76] *Id.*

EXHIBIT 1: EXAMPLES OF OPEN AND CLOSED TRANSITION TERMS.

Open Transition Terms	Closed Transition Terms
Comprising	Consisting of
Comprised of	Consisting essentially of
Having	Composed of
Including	Formed of
Characterized by	

Therefore, the presence of a closed transition term can serve to potentially narrow claim scope.

CASE STUDY: U.S. PATENT NO. 5,787,449.

Case Study: U.S. Patent No. 5,787,449 Analysis of Claim 14
Claim 14 uses the open transition term "comprising," such that any accused process that includes all recited claim steps will infringe, regardless of whether the accused process includes additional steps not recited by the claim.

3. Specific Ranges

¶47 Specific ranges included in the claims, i.e., heating a material to between 300 and 400 degrees, can also further limit claim scope. Endpoints in claimed ranges provide definitive bounds, and anything outside of those bounds will not infringe.[77]

CASE STUDY: U.S. PATENT NO. 5,787,449.

Case Study: U.S. Patent No. 5,787,449 Analysis of Claim 14
Claim 14 includes no specific ranges reducing claim scope.

4. Multiple Infringer Issues/Necessary Reliance on Indirect Infringement Theories

¶48 An ideally written claim contemplates infringement by a single entity. If, however, a claim requires multiple parties to act in order to infringe the claim (no single party individually performs all elements, or a party sells a product and infringement only occurs when a customer uses the product in a particular way), the claim has a multiple infringer issue and places the patent owner in the realm of having to prove indirect infringement via active inducement[78] or contributory infringement.[79]

[77] U.S. Philips Corp. v. Iwasaki Elec. Co., 505 F.3d 1371, 1376–78 (Fed. Cir. 2007).

[78] 35 U.S.C. § 271(b) (2006) ("Whoever actively induces infringement of a patent shall be liable as an infringer.").

¶49 To prove active inducement, the patent owner must demonstrate that the "alleged infringer's actions induced infringing acts *and* that he knew or should have known his actions would induce actual infringements."[80] Further, the patent owner must show that the alleged infringer had more than mere knowledge of the infringing use of its products, rather, it must show "evidence of culpable conduct, directed to encouraging another's infringement" and evidence of such intent via advertising an infringing use can support a finding of an intention for the product to be used in an infringing manner.[81]

¶50 Contributory infringement exits when a party knowingly produces a material or component "especially made" or "especially adapted" for use in an infringing product, and that material or component is "not a staple article or commodity of commerce suitable for a non-infringing use."[82] Thus, to prove contributory infringement, the patent owner must prove that the accused infringer (1) knew that the material or components it manufactured would be used in an infringing manner and (2) the materials or components otherwise have "no substantial non-infringing uses."[83]

¶51 While not impossible to deal with, having to assert infringement under these theories complicates the analysis somewhat. Further, for *indirect infringement* to hold, *direct infringement* must exist. Thus, at some point some entity must meet all elements of the asserted claim.

CASE STUDY: U.S. PATENT NO. 5,787,449.

Case Study: U.S. Patent No. 5,787,449 **Analysis of Claim 14**
Because Claim 14 is a method claim addressing the creation and storage of electronic documents, a likely infringer will include a software manufacturer. However, sale of a software package, by itself, will not infringe the method claim. It requires a user to perform the recited steps using the software package in question. Thus, in order for a software manufacturer to come under the limitations of the claim, the patent owner must rely on an indirect infringement analysis via contributory infringement or inducement of infringement. The patent owner may use advertisements of the accused infringer showing it advocated using its device in an infringing manner for an active inducement determination, for example.

5. Means-Plus-Function Elements

¶52 A means-plus-function claim element is one which, ostensibly, allows a claim drafter to claim an end result (storing data, for example) without providing any guidance

[79] 35 U.S.C. § 271(c)

("Whoever offers to sell or sells within the United States or imports into the United States a component of a patented machine, manufacture, combination or composition, or a material or apparatus for use in practicing a patented process, constituting a material part of the invention, knowing the same to be especially made or especially adapted for use in an infringement of such patent, and not a staple article or commodity of commerce suitable for substantial noninfringing use, shall be liable as a contributory infringer.").

[80] Lucent Techs., Inc. v. Gateway, Inc., 580 F.3d 1301, 1321–22 (Fed. Cir. 2009) (emphasis added) (internal quotations and citations omitted).

[81] *Id.* at 1322 (internal quotations and citations omitted).

[82] *Id.* at 1320.

[83] *Id.*

in the claim as to how to actually achieve the end result (claiming no memory device, or storage unit, for example). If a claim includes elements written in the form of: "means for [performing some function]" then the claim falls under the purview of 35 U.S.C. § 112 ¶ 6 as a "means-plus-function" claim limitation.[84] At first glance, such a limitation seems ideal in that a patent can claim a particular function and, ostensibly, any structure or device used to perform that function would meet the limitation. The Federal Circuit, however, has held that the provision of the Patent Act allowing this claim form actually limits the claim form to the structure disclosed in the patent's specification.[85] Therefore, to meet a means-plus-function limitation, a device must perform the *identical function* recited in the claim using the *identical or equivalent structure* disclosed in the patent's specification.[86] Thus, even if an accused product performs the identical function of a means-plus-function element, if it does so with sufficiently different structure than that disclosed in the patent's specification, the accused product does not meet the limitation.

[84] 35 U.S.C. § 112 ¶ 6 ("An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.").

[85] Biomedino, LLC v. Waters Techs. Corp., 490 F.3d 946, 948 (Fed. Cir. 2007) ("[Section] 112, ¶ 6 permitted 'broad means-plus-function language, but provided a standard to make the broad claim language more definite[:] . . . [t]he applicant must describe in the patent specification some structure which performs the specified function.'") (internal citations omitted).

[86] Minks v. Polaris Indus. Inc., 546 F.3d 1364, 1377 (Fed. Cir. 2008) ("The first step in construing such a limitation is to identify the function of the means-plus-function limitation. . . . The next step is to identify the corresponding structure in the written description necessary to perform that function.") (internal citations and quotations omitted).

CASE STUDY: U.S. PATENT NO. 5,787,449 .

Case Study: U.S. Patent No. 5,787,449 **Analysis of Claim 14**	
Claim 14 arguably includes means-plus-function claim language in that it recites a "map storage means," a "mapped content storage means," and a "distinct storage means."	
14. A method for producing a first map of metacodes and their addresses of use in association with mapped content and stored in distinct **map storage means**, the method comprising: providing the mapped content to **mapped content storage means**; providing a menu of metacodes; compiling a map of the metacodes in the **distinct storage means**, by locating, detecting, and addressing the metacodes; and providing the document as the content of the document and the metacode map of the document.	If the associated claim elements fall within "112 ¶ 6," as practitioners refer to such situations, one must determine what the (1) function and (2) structure of these limitations are in order to perform a proper comparison with an accused device. The function of the "**map storage means**" of the preamble appears to be **storing a map of metacodes and their addresses**. The corresponding structure appears to be the **metacode map storage, labeled 140, stored in primary storage, labeled 140, of Fig. 7**. See Appendix B. The function of the "**mapped content storage means**" recited in the first element appears to be **storing the mapped content**. The corresponding structure appears to be the **mapped content storage, labeled 132, stored in primary storage, labeled 140, of Fig. 7**. See Appendix B. The reference to "distinct storage means" in the third element appears to be simply a collective recitation to the two storage means discussed above, thus the same analysis would apply.

6. Limiting Language within the Specification

¶53 Language within the specification can also serve as a limitation on claim scope. While it is not proper to read limitations from the specification into the claim,[87] statements that expressly or by implication state that certain subject matter resides outside of the scope of the claims will disclaim claim scope.[88] Further, any absolute language in the specification (always, never, none, must, only, etc.) can be cause for concern when interpreting the scope of the claims.

[87] Intervet Am., Inc. v. Kee-Vet Labs., Inc., 887 F.2d 1050, 1053 (Fed. Cir. 1989) (holding that "interpreting what is meant by a word in a claim is not to be confused with adding an extraneous limitation in the specification, which is improper").

[88] *See, e.g.*, Honeywell Int'l, Inc. v. ITT Indus., Inc., 452 F.3d 1312, 1318 (Fed. Cir. 2006).

CASE STUDY: U.S. PATENT NO. 5,787,449.

Case Study: U.S. Patent No. 5,787,449 **Analysis of Claim 14**	
The specification does not contain any glaring language that would severely limit the interpretation of the claim elements of claim 14. However, the specification does contain some specific definitions, which will color the interpretation of certain terms used in the claims. See below.	
14. A method for producing a first map of **metacodes** and their addresses of use in association with mapped content and stored in **distinct map storage means**, the method comprising:	The specification states that "**metacodes**" (document formatting information) are separated from the content and held in "**distinct storage**" such that the claim should be interpreted to mean that content and formatting cannot reside comingled within a single storage location. Further, the specification provides a specific definition of "metacodes" as an individual instruction which controls the interpretation of the content of a document: The invention does not use embedded metacoding to differentiate the content of the document, but rather, the metacodes of the document are separated from the content and held in distinct storage in a structure called a metacode map, whereas document content is held in a mapped content area. Raw content is an extreme example of mapped content wherein the latter is totally unstructured and has no embedded metacodes in the data stream. A metacode, which includes but is not limited to a descriptive code, is an individual instruction which controls the interpretation of the content of the data, i.e., it differentiates the content. A metacode map is a multiplicity of metacodes and their addresses associated with mapped content. An address is the place in the content at which the metacode is to exert its effect. Col. 4, lines 5–20.

CASE STUDY: U.S. PATENT NO. 5,787,449 CONTINUED.

Case Study: U.S. Patent No. 5,787,449 **Analysis of Claim 14**	
The specification does not contain any glaring language that would severely limit the interpretation of the claim elements of claim 14. However, the specification does contain some specific definitions, which will color the interpretation of certain terms used in the claims. See below.	
providing the mapped content to mapped content storage means;	
providing a menu of metacodes;	
compiling a map of the metacodes in the distinct storage means, by **locating, detecting, and addressing** the metacodes; and	The specification provides a distinct definition for "**locating, detecting, and addressing**" the metacodes, which could serve to limit their scope: By "detecting" is meant recognizing, identifying or differentiating a metacode from content; by "locating" is meant finding the position of a metacode in and relative to an input content stream; and by "addressing" is meant forming a unique identifier which defines the position of a metacode relative to the mapped content stream. Col. 4, lines 36–41.
providing the document as the content of the document and the metacode map of the document.	The specification specifically defines "**document**" and provides a distinct interpretation of what it means to **provide a document** under the claimed invention: By the term "document" as used in this specification is meant a non-random aggregation of data irrespective of its mode of storage or presentation. Col. 4, lines 56–58. Delivering a complete document would entail delivering both the content and a metacode map which describes it. Col. 4, lines 23–24.

7. Limiting Language within the Prosecution History

¶54 As discussed briefly above, the prosecution history (also known as the "file wrapper") constitutes the record of communications between the patent applicant and the U.S. Patent and Trademark Office (PTO) from the time of filing of the application until it issues. Any disclaimers of claim scope in the public record serve as binding disavowals of such scope.[89] The patent owner cannot reclaim the disclaimed scope after the patent

[89] Springs Window Fashions, LP v. Novo Indus., LP, 323 F.3d 989, 995 (Fed. Cir. 2003) ("The public notice function of a patent and its prosecution history requires that a patentee be held to what he declares

issues.[90] Therefore an analysis of the prosecution history will also determine the extent of patent scope limitation, if any.

CASE STUDY: U.S. PATENT NO. 5,787,449.

Case Study: U.S. Patent No. 5,787,449 **Analysis of Claim 14**
The patent underwent a long prosecution process with much correspondence between the patent applicant and the PTO. This created a voluminous record, which typically provides more opportunities for a patent applicant to make statements that will limit claim scope. However, the patent applicant's representative, for the most part, remained consistent in communications with the PTO and did not make statements unduly limiting claim scope. The patent applicant's representative did, however, amend claim 14 on two occasions to overcome prior art. These amendments and accompanying remarks by the patent applicant mean that the patent applicant has limited the scope of these elements to their literal meaning and has disavowed infringement of these elements under the doctrine of equivalents. Further, the patent applicant characterized the claimed "distinct" nature of the storage location of the formatting information (the "metacodes") and the document content as "persistent" and "non-temporary." This statement disavowed any interpretation of "distinct" storage to include temporary storage. Thus, any process that stores formatting information in a temporary storage location separate from document content, for example, would not fall under the claims of the patent based on these statements. See more detailed information below.

during the prosecution of his patent.").

[90] *See, e.g.*, Omega Eng'g, Inc. v. Raytek Corp., 334 F.3d 1314, 1323–24 (Fed. Cir. 2003).

CASE STUDY: U.S. PATENT NO. 5,787,449 CONTINUED.

Case Study: U.S. Patent No. 5,787,449 **Analysis of Claim 14**	
14. A method for producing a first map of metacodes and their addresses of use in association with mapped content and stored in **distinct map storage means**, the method comprising:	In distinguishing the invention over the prior art, the applicant stated that "[t]his separation [of metacodes from document content] is achieved by extracting metacodes from an existing document (or from a document being created) and creating a persistent (i.e., non-temporary) map of the location of the metacodes in the document and then storing the map and the content of the document separately." File History, July 1, 1997 Amendment at p. 8 (emphasis in the original).
providing the mapped content to mapped content storage means;	
providing a menu of metacodes;	
compiling a map of the metacodes in the distinct storage means, **by locating, detecting, and addressing the metacodes**; and	The applicant amended claim 14 to add the limitation "**locating, detecting, and addressing the metacodes**" to overcome prior art. File History, August 19, 1996 Amendment at p. 2. The applicant did this to characterize the meaning of the word "compiling." *Id*. at p. 8. Specifically, the applicant stated that "compiling" as used in the patent is not synonymous with use of the term in the computer programming realm where the term refers to "generating object code from source code." *Id.* This serves to limit the scope of the meaning of this claim term to exclude such actions.
providing the document as the content of the document and the metacode map of the document.	The applicant amended claim 14 to add the limitation "**providing the document as the content of the document and the metacode map of the document**" to overcome prior art. File History, July 1, 1997 Amendment at p. 3–4. The applicant did this to emphasize the separation of formatting information and content information of electronic documents as contemplated by the invention. This serves to limit the scope of the meaning of this claim limitation to exclude documents presented with formatting codes embedded within the content. File History, July 1, 1997 Amendment at p. 7–8.

C. Identify the Covered Technology

¶55 Upon determining the scope of the claims, the next step consists of determining what technology and products, if any, the patent claims cover. Determining what technology and products are covered by the patent requires an understanding of the technological field in question and the operation of the accused products. Such an understanding allows one to fully comprehend the scope of any potential infringement in terms of, for example, infringing units sold, which can prove illustrative in the estimation of damages discussed below.

CASE STUDY: U.S. PATENT NO. 5,787,449.

Case Study: U.S. Patent No. 5,787,449 **Analysis of Claim 14**
In the case study example, the technology covered by claim 14 of the patent includes Microsoft Word 2007 XML file format. Because claim 14 claims a process for creating a document having formatting information stored separately from content information, sales of this software product, by itself, do not fall under the language of the claims. Consequently, the theory of infringement must include an indirect infringement theory. Here, the active inducement theory of indirect infringement applies. As discussed above, a patent owner may rely on an accused infringer's advertising or instructions to others to use the product in an infringing manner to prove active inducement. As shown in **Appendix B** in a claim chart on an element-by-element basis, Microsoft's product meets every limitation of the claim when used in the manner suggested by Microsoft in creating documents in XML format in Word 2007. Further, the potential limitations of claim scope via statements in the specification and the prosecution history, discussed above, do not so narrow the scope of the claims so as to fail to encompass the Word 2007 XML format.

D. Determine a Likely Damages Award Using a Reasonable Royalty Determination

¶56 The Patent Act entitles a patent owner to recover either lost profits or a reasonable royalty as compensation for infringement by another.[91] The reasonable royalty determination serves as the most appropriate calculation for the valuation methodology articulated in this article. Recall that the valuation methodology is best suited for patents currently generating no revenue and covering no products currently marketed or sold by the patent owner, but clearly covering products or services provided by other companies. As a result of the latter, the patent owner normally cannot avail itself of the lost profits determination, because one must generally sell a patented product for this calculation to apply.[92] Thus, the reasonable royalty determination serves as the basis upon which to determine the scope of a potential damages award or potential licensing revenue stream.

1. Determine the Appropriate Royalty Rate

¶57 Despite neither making nor selling a product in the U.S., a patent owner may nonetheless collect damages for patent infringement in the form of a reasonable royalty, which, theoretically, constitutes a floor to patent infringement awards.[93] Although

[91] 35 U.S.C. § 284 (2006).

[92] *See* Rite-Hite Corp. v. Kelley Co., 56 F.3d 1538, 1548 (Fed. Cir. 1995) (en banc) ("Whether a patentee sells its patented invention is not crucial in determining lost profits damages. Normally, if the patentee is not selling a product, by definition there can be no lost profits."). Further, the patent owner must establish that "but for" the infringement, the patent owner would have, in fact, made the sales allegedly diverted away by the infringing activity and does so via a four-part test known as the *Panduit* test. The patent owner must prove that there was (1) a demand for the product, (2) an absence of acceptable non-infringing substitutes, (3) the patent owner had manufacturing and marketing capabilities to exploit the demand, and (4) the amount of profit that the patent owner could have made. Panduit Corp. v. Stahlin Bros. Fibre Works, Inc., 575 F.2d 1152, 1156 (6th Cir. 1978). *See also* MATTHEWS, *supra* note 75, § 30:22 (The patent owner can prove the amount of lost profits (part 4 of the test) utilizing "lost sales, price erosion, and increased expenditures caused by the infringement."); Hebert v. Lisle Corp., 99 F.3d 1109, 1119 (Fed. Cir. 1996).

[93] MATTHEWS, *supra* note 75, § 30:72.

guidelines exist to aid in establishing an appropriate rate, the Federal Circuit has acknowledged that any reasonable royalty analysis "necessarily involves an element of approximation and uncertainty."[94] Further, an additional challenge in establishing a royalty rate stems from the fact that many licensing agreements and their associated terms, including royalty rates, remain confidential. Nevertheless, the analysis below provides a discussion of (1) the practical reality of royalty rates for technology areas most appropriate for this valuation methodology and (2) the established theoretical frameworks for determining an appropriate royalty amount.

¶58 *a) Royalty Rates in Practical Terms*.—In practical terms, the royalty rate for patents in the information technology, telecommunications, software, and computer hardware industries ranges, on average, from **2% to 7%** of sales with **5%** most often used.[95] This range has emerged from known rates agreed to by companies over years of patent licensing activity in these technology areas.

¶59 *b) Royalty Rates in Theory*.—In theory, establishing the royalty rate stems from either an established industry rate, if available, or via one of two other approaches: (1) the "analytical approach" or (2) the "hypothetical negotiation" (the more popular of the two).[96]

¶60 If a patent owner has a history of licensing its patent at a particular rate for similar conduct, that history serves as a good proxy for the established royalty rate.[97] To arrive at a royalty rate, the analytical approach compares the infringer's profits with that of the industry. Alternatively, the hypothetical negotiation presupposes an arms-length negotiation between the patent owner and the alleged infringer at the time of the infringement.[98] The hypothetical negotiation, as discussed above, serves as the more popular of these approaches and attempts to go back in time before the infringement began to assess what rate the parties would have agreed upon.[99] This method arises out of a fifteen-factor test known as the Georgia-Pacific factors, which can be used to assess the

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[94] *See* Lucent Techs., Inc. v. Gateway, Inc., 580 F.3d 1301, 1336 (Fed. Cir. 2009) (quotation omitted).

[95] *See* Patent Damages Expert, *supra* note 63. *See generally* Jonathan E. Kemmerer & Jiaqing Lu, *Profitability and Royalty Rates Across Industries: Some Preliminary Evidence*, 10, 12, http://www.royaltysource.com/news/Profitability%20and%20Royalty%20Rates.pdf (last visited Nov. 29, 2010) (Kemmerer and Lu's research looks at royalty rates as a function of industry profitability.).

[96] *See* Patent Damages Expert, *supra* note 63.

[97] Monsanto Co. v. McFarling, 488 F.3d 973, 978–79 (Fed. Cir. 2007)

> ("An established royalty is usually the best measure of a 'reasonable' royalty for a given use of an invention because it removes the need to guess at the terms to which parties would hypothetically agree. When the patentee has consistently licensed others to engage in conduct comparable to the defendant's at a uniform royalty, that royalty is taken as established and indicates the terms upon which the patentee would have licensed the defendant's use of the invention.").

[98] MATTHEWS, *supra* note 75, § 30:72.

[99] *See Lucent,* 580 F.3d at 1324–25

> ("[The] more common approach, called the hypothetical negotiation or the 'willing licensor-willing licensee' approach, attempts to ascertain the royalty upon which the parties would have agreed had they successfully negotiated an agreement just before infringement began. . . . The hypothetical negotiation tries, as best as possible, to recreate the ex ante licensing negotiation scenario and to describe the resulting agreement. In other words, if infringement had not occurred, willing parties would have executed a license agreement specifying a certain royalty payment scheme. The hypothetical negotiation also assumes that the asserted patent claims are valid and infringed.").

appropriate reasonable royalty amount.[100] Again, the Georgia-Pacific factors provide a theoretical framework for determining a reasonable royalty rate via the hypothetical negotiation approach; in practical terms, however, a reasonable royalty typically resides within the 2% to 7% range for technology areas associated with the methodology put forth by this article.

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[100] Georgia-Pacific Corp. v. U.S. Plywood Corp., 318 F. Supp. 1116, 1120 (S.D.N.Y. 1970), *modified*, 446 F.2d 295 (2d Cir. 1971). These *Georgia-Pacific* factors include:

> 1. The royalties received by the patentee for the licensing of the patent in suit, proving or tending to prove an established royalty.
>
> 2. The rates paid by the licensee for the use of other patents comparable to the patent in suit.
>
> 3. The nature and scope of the license, as exclusive or non-exclusive; or as restricted or non-restricted in terms of territory or with respect to whom the manufactured product may be sold.
>
> 4. The licensor's established policy and marketing program to maintain his patent monopoly by not licensing others to use the invention or by granting licenses under special conditions designed to preserve that monopoly.
>
> 5. The commercial relationship between the licensor and licensee, such as, whether they are competitors in the same territory in the same line of business; or whether they are inventor and promoter.
>
> 6. The effect of selling the patented specialty in promoting sales of other products of the licensee; that existing value of the invention to the licensor as a generator of sales of his non-patented items; and the extent of such derivative or convoyed sales.
>
> 7. The duration of the patent and the term of the license.
>
> 8. The established profitability of the product made under the patent; its commercial success; and its current popularity.
>
> 9. The utility and advantages of the patent property over the old modes or devices, if any, that had been used for working out similar results.
>
> 10. The nature of the patented invention, the character of the commercial embodiment of it as owned and produced by the licensor, and the benefits to those who have used the invention.
>
> 11. The extent to which the infringer has made use of the invention, and any evidence probative of the value of that use.
>
> 12. The portion of the profit or of the selling price that may be customary in the particular business or in comparable businesses to allow for the use of the invention or analogous inventions.
>
> 13. The portion of the realizable profit that should be credited to the invention as distinguished from non-patented elements, the manufacturing process, business risks, or significant features or improvements added by the infringer.
>
> 14. The opinion testimony of qualified experts.
>
> 15. The amount that a licensor (such as the patentee) and a licensee (such as the infringer) would have agreed upon (at the time the infringement began) if both had been reasonably and voluntarily trying to reach an agreement; that is, the amount which a prudent licensee—who desired, as a business proposition, to obtain a license to manufacture and sell a particular article embodying the patented invention—would have been willing to pay as a royalty and yet be able to make a reasonable profit and which amount would have been acceptable by a prudent patentee who was willing to grant a license.

CASE STUDY: U.S. PATENT NO. 5,787,449.

Case Study: U.S. Patent No. 5,787,449 **Analysis of Claim 14**
As the patent claim in question relates to software, the case study uses a **5%** royalty rate. The case study also presents a sensitivity analysis using 2% and 7% as well.

2. Apply the Royalty Rate to Revenues Generated by the Accused Product

¶61 After determining the appropriate royalty rate, one must determine the economic scope of the infringing product which requires a determination of the revenues attributable to the infringing product. This endeavor can prove nontrivial if the manufacturer or seller of the infringing product does not separately report revenues of the product in question. It also requires the use of reasoned assumptions to arrive at revenue figures. Further, one must project future revenues for the infringing product which coincide with the remaining enforceable term of the patent. Applying the royalty rate to revenues attributable to the infringing product yields a likely royalty stream owed to the patent owner.

CASE STUDY: U.S. PATENT NO. 5,787,449.

Case Study: U.S. Patent No. 5,787,449

Analysis of Claim 14

Microsoft does not separately report revenue figures for its Word 2007 software, which Microsoft includes in its Office suite of software products. It attributes revenues associated with its Office products to the Microsoft Business Division (MBD) business sub segment and reports that Office products make up 90% of MBD revenues. Further complicating matters, although Microsoft reports total U.S. revenues separately from total worldwide revenues, it does not geographically delineate MBD revenues. Therefore, reasoned assumptions must be made to arrive at revenue numbers (and projections) for Word 2007:[101]

1) Use the percentage of total sales attributable to the US compared to Microsoft's total worldwide sales to determine an average percentage of sales attributable to the US:

Year	**2007**	**2008**	**2009**
US Revenues	$ 31,346	$ 35,928	$ 33,052
World Wide Revenues	$ 51,122	$ 60,420	$ 58,437
% of Sales US	**61%**	**59%**	**57%**
Average	**59%**		

2) Use the average percentage of sales figure attributable to the U.S. (59%), the reported MBD worldwide revenue figures, and the reported 90% of MBD sales attributable to the Office suite of products to arrive at U.S. sales figures for the Office suite of products:

Year	**2007**	**2008**	**2009**
MBD WW Revenues	$ 16,478	$ 18,935	$ 18,902
Attributable to US (59%)	$ 9,741	$ 11,193	$ 11,174
Attributable to Office (90%)	$ 8,767	$ 10,074	$ 10,056

[101] All revenue numbers are in millions and all reported financials come from Microsoft's 2009 10-K. *See* MICROSOFT, ANNUAL REPORT (Form 10-K) (July 30, 2009), *available at* http://www.sec.gov/Archives/edgar/data/789019/000119312509158735/d10k.htm.

CASE STUDY: U.S. PATENT NO. 5,787,449 CONTINUED.

Case Study: U.S. Patent No. 5,787,449

Analysis of Claim 14

3) Assume that Word 2007 constitutes 25% of Office revenues. Also, the patent in question was filed on June 2, 1994 and issued on July 28, 1998. Because the patent was pending on June 8, 1995, it expires either 17 years from issue or 20 years from filing, whichever is longer (note, any patents filed on or after June 8, 1995 expire 20 years from filing). The longer of the two is 17 years from issue, so the patent in question expires on **July 28, 2015**. Any sales of Word 2007 from 2007 to July 28, 2015 fall within the scope of damages for the patent in question. In projecting sales from 2010 to 2015, the MBD unit experienced a 5% CAGR from 2007 to 2009, so this number was used in this case study as an annual growth rate to project sales. Also note that the patent is in force for 58% of the year during its year of expiration (2015), and the projection was adjusted accordingly:

Word % of Office Sales	25%									
CAGR MBD WW Revenues	5%									
% of Year in Force in 2015	58%									
Year		**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Attributable to Word 2007		$ 2,191.65	$ 2,518.45	$ 2,514.06	$ 2,632	$ 2,755	$ 2,884	$ 3,019	$ 3,160	$ 1,919

4) Applying a 5% royalty rate to the revenues attributable to Word 2007, yields the following likely royalty stream for damages purposes:

Royalty Rate	5.0%									
Year		**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Royalty Stream		$ 109.58	$ 125.92	$ 125.70	$ 131.59	$ 137.75	$ 144.19	$ 150.94	$ 158.01	$ 95.94

E. Determine the Appropriate Discount Rate

¶62 According to finance principles, the value of any asset stems from the value of any future cash flows generated by that asset, discounted at an appropriate rate reflecting the associated risk of those cash flows.[102] As nothing in the literature suggests an appropriate discount rate for discounting revenues generated by patents, *per se*,[103] this section of the article attempts to arrive at such a discount rate utilizing the capital asset pricing model (CAPM).[104] The CAPM holds that the risk free rate added to an asset's beta multiplied

[102] *See, e.g.*, KOLLER, *supra* note 69, at 106.

[103] The closest attempt is discussed by van Triest, in which the author states that "[d]etermining the correct discount rate [for patents] is difficult." van Triest & Vis, *supra* note 30, at 288. Thus, the author uses the cost of capital for the entire chemical company as a discount rate for patent royalties, *id.* at 289, and acknowledges that using a firm-wide discount rate for patent valuation can "result in distortions" for a chemical company that engages in other revenue generating activities apart from patent licensing and enforcement. *Id.* at 290 n.3.

[104] For a detailed discussion of the theory of the capital asset pricing model, see RICHARD A. BREALEY & STEWART C. MEYERS, PRINCIPLES OF CORPORATE FINANCE 214–22 (9th ed. 2008), *see also* KOLLER, *supra* note 69, at 294–96; HOLTHAUSEN & ZMIJEWSKI, CORPORATE VALUATION: THEORY, PRACTICE, AND EVIDENCE Ch. 11.3 (forthcoming).

by the market risk premium yields the expected return on the asset.[105] Although the CAPM is used primarily to glean expected returns on equity securities (stocks, for example), it can be used to price any risky asset.[106] See the formula depicted below:

$$E(R_p) = r_f + \beta_q(E(R_m) - r_f)$$

In the above formula,

- $E(R_p)$ = the expected return on the asset (p);
- r_f = the risk free rate;
- β_p = the sensitivity of the asset to broader market movements; and
- $E(R_m)$ = the expected return on the market.

The result of the subtraction of the risk free rate from the expected return on the market is also known as the market risk premium (MRP). Therefore, the CAPM formula can also be written as follows:

$$E(R_p) = r_f + \beta_p(MRP)$$

In finding the expected return, we estimate the three inputs to the CAPM formula (rf, βp, and MRP). The risk free rate and the MRP are the same for all assets; however, the asset's beta is unique to the asset.[107] The methodology estimates values for all three inputs described below, and begins with a calculation for beta which is specific to patents.

1. Determine the "Industry" Beta for Patents

¶63 To use the CAPM model to arrive at a discount rate specific to patents, we must make an estimation of beta that, ideally, is purely associated with patents. This is no easy task, because patents are not currently publicly traded, so we must select a proxy. Presently, only one pure-play patent licensing company trades on a public exchange in the U.S.: Acacia Technologies.[108] Acacia purchases patent portfolios purely to derive revenue from licensing those patents. Its closest publicly-listed compatriot in the pure-play patent licensing space is InterDigital,[109] with the primary difference being that InterDigital has engineers on staff to develop, patent, and license its technology. Therefore, we will use the returns for these two companies (discussed in more detail below) to determine a pure-play patent beta.

¶64 *a) Select Comparable Companies*.—As discussed briefly above, Acacia is currently the only pure-play publicly listed company engaged in the business of patent

[105] KOLLER, *supra* note 69, at 294.
[106] HOLTHAUSEN, *supra* note 104, at Ch. 11.4.
[107] KOLLER, *supra* note 69, at 295.
[108] ACACIA TECHNOLOGIES, http://www.acaciatechnologies.com/ (last visited Oct. 29, 2010).
[109] INTERDIGITAL, http://www.interdigital.com/ (last visited Oct. 29, 2010).

monetization. Indeed, Acacia purchases patent portfolios purely for the purpose of extracting licensing revenues from those portfolios.[110] Its patents mostly cover items related to information technology, such as semiconductors, consumer electronics, software, wireless, and computer hardware and peripherals. It carries no debt and no inventories.[111]

¶65 InterDigital is a similarly situated company in that it garners the majority of its cash flows and revenues from licensing its more than 1,058 patents in the wireless space.[112] For example, over 90% of InterDigital's 2008 revenues originated from its patent licensing activities.[113] Unlike Acacia, however, it develops most of its own technology in-house with its team of engineers. Furthermore, InterDigital licenses its wireless patents to communications hardware companies globally, such that over 50% of 3G mobile handset devices sold are currently under InterDigital license.[114]

¶66 These two companies constitute the best proxy for determining a patent-specific beta because of their business models, which revolve around generating revenues via patent licensing. Consequently, the vast majority of their respective betas stem purely from patent issues, *per se* and exclude other risk factors associated with other companies with large patent portfolios but whose primary business function does not involve generating revenues purely from their patent assets. Further, they share other similarities such as the fact that they carry little debt, have no inventories, and are subject to the same shocks (alterations in patent law, for example).

EXHIBIT 2: COMPARABLE COMPANY INFORMATION.

Company	2008 Rev (M)	%Rev from Patent Licensing	Debt/Equity	Inventories
Acacia	$48.23	100%	0%	$0
InterDigital	$228.50	90%	3%	$0

¶67 *b) Perform Market Regression for Each Against the S&P 500.*—We begin by performing a market model regression of the monthly returns (as opposed to price) of Acacia and InterDigital compared to the returns of S&P 500 (including dividends) over a five-year period (2004–2008).[115] Comparing the returns to the broad-based S&P provides for more accurate results, and the five-year period of monthly returns (allowing

[110] ACACIA, ANNUAL REPORT (2008); CRAIG-HALLUM CAPITAL GROUP, LLC, ANALYST REPORT (Nov. 30, 2009).

[111] ACADIA, ANNUAL Report (2008).

[112] INTERDIGITAL, ANNUAL REPORT 8, 46 (2008), *available at* http://files.shareholder.com/downloads/IDCC/1021105715x0x291537/2B3F385A-A0A2-47BE-AB7D-EB1C4E74A20E/InterDigital_2008_Annual_Report.pdf.

[113] *Id.* at 58.

[114] *Id.* at 2.

[115] The stock and market return data were collected from the Wharton Research Data Services (WRDS) database. *See* WHARTON RESEARCH DATA SERVICES, https://wrds.wharton.upenn.edu/wrdsauth/members.cgi?URI=/home/valuation/index2.shtml (last visited Sept. 24, 2010) [hereinafter WRDS].

for 60 observations each) also improves the statistical accuracy of the regressions.[116] Further, over this five-year period, neither Acacia's nor InterDigital's business models or capital structures changed, meaning that their raw betas should not have experienced any drastic changes. In the regression, the monthly returns for the companies constitute the y-axis terms, and the monthly returns on the S&P constitute the x-axis terms. Based on this, the results of the market model regressions for each company will yield an equation of a line with beta forming the slope term. The regression yields the following formula:

$$\text{Company Return} = \beta(\text{S\&P 500 Return}) + \alpha + \varepsilon$$[117]

Performing the regression described above yields a raw beta for Acacia of **1.5983** and a raw beta for InterDigital of **1.0309.**

[116] *Id.* at 307–310.

[117] The ε symbol constitutes noise or error, which signifies that we can never observe a company's true beta, only estimates of it. *See, e.g.*, HOLTHAUSEN, *supra* note 104, at Ch. 11.7.

EXHIBIT 3: RAW COMPANY BETA.

Company	Raw Beta
Acacia	1.5984
InterDigital	1.0309

Further, see the scatter plots for each regression below.

EXHIBIT 4: ACACIA REGRESSION.

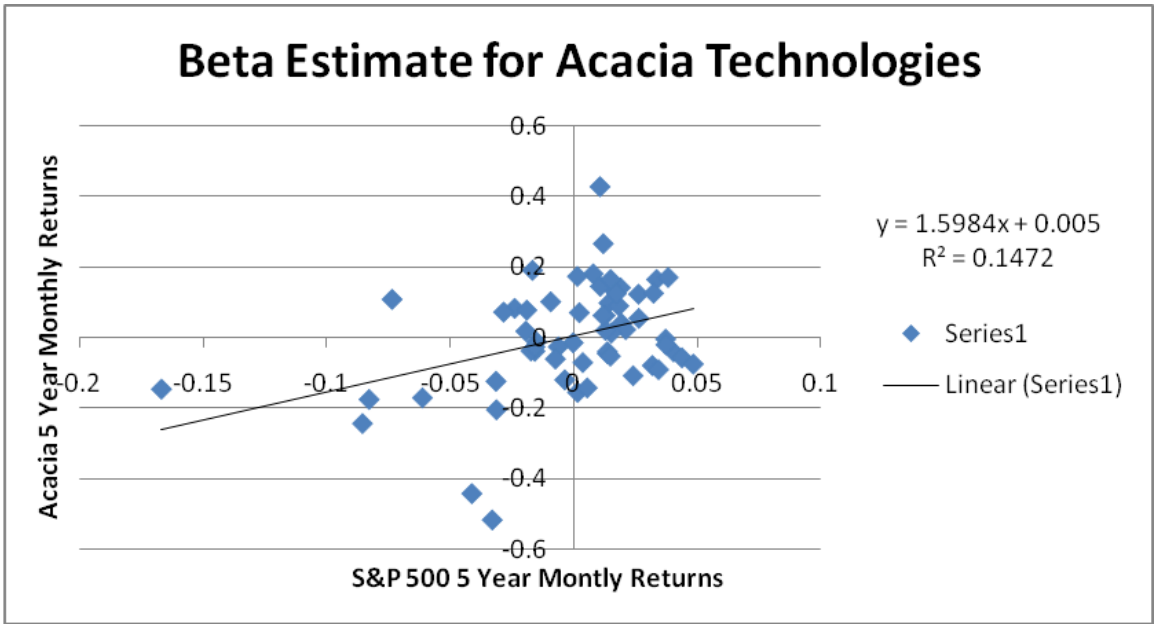
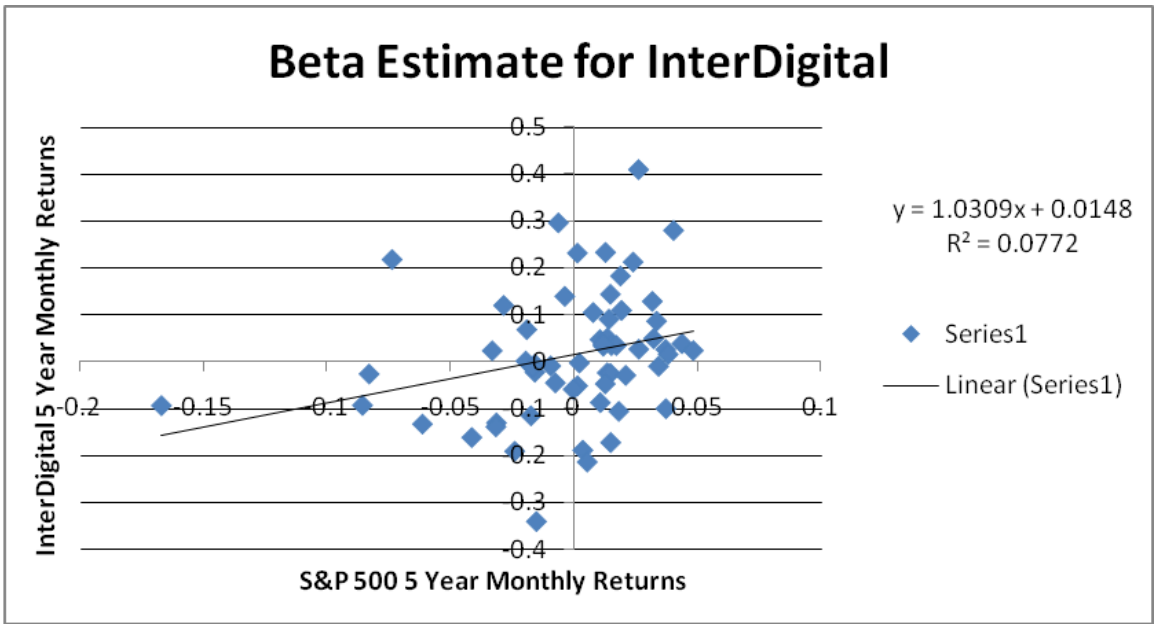


EXHIBIT 5: INTERDIGITAL REGRESSION.



¶68 *c) Adjust the "Raw" Betas for Mean Reversion*.—Research has shown that over time, forward-looking asset betas revert to the mean, which for all asset betas equals 1 (perfectly correlated with the broader market).[118] To account for this, one can adjust the raw betas for this mean reversion to obtain an adjusted beta estimate. The raw betas for this exercise were adjusted using the Bloomberg adjusted beta formula:

Bloomberg Adjusted Beta = 0.33 + 0.67(Raw Beta)[119]

Performing the Bloomberg mean reversion adjustment on Acacia's and InterDigital's raw betas yields adjusted betas of **1.4009** for Acacia and **1.0207** for InterDigital, respectively.

EXHIBIT 6: BLOOMBERG ADJUSTED BETAS.

Company	Bloomberg Adjusted Beta
Acacia	1.4009
InterDigital	1.0207

¶69 *d) Unlever the Adjusted Betas*.—The adjusted betas we have for Acacia and InterDigital constitute their adjusted equity betas. Recall that our goal is to determine a beta for the patents, or an "industry" beta. We therefore want a beta that reflects patents (the "industry") and does not reflect any added risk associated with capital structure choices by any of the companies. Specifically, we want to eliminate the effects of leverage (debt) on the calculated betas. Consequently, it will prove necessary to unlever

[118] KOLLER, *supra* note 69, at 314.
[119] *Id.*

the betas. As discussed above, Acacia has carried no debt for the entire five-year period used in the calculations.[120] As a result, the beta calculated above is its unlevered beta. InterDigital, however, has carried a small amount of debt on its books for the five-year period (between 1% and 3% of assets).[121] Therefore, to attain the highest degree of accuracy, unlevering InterDigital's beta is necessary. Using the unlevering formula listed below, we arrive at InterDigital's unlevered beta.

$$\beta levered = \beta unlevered * (1+Debt/Equity)$$ [122]

Applying the unlevering formula to InterDigital's adjusted beta yields an unlevered adjusted beta of .**99099**.

¶70 *e) Take the Average of the Adjusted Unlevered Betas*.—Taking the average of the unlevered adjusted betas for Acacia (1.4009) and InterDigital (.99099) yields a patent beta of **1.19596**.

EXHIBIT 7: UNLEVERED ADJUSTED BETAS AND CALCULATED PATENT BETA.

Company	Unlevered Adjusted Beta
Acacia	1.4009
InterDigital	.99099
Patent Beta (average of the above)	**1.19596**

2. Use the CAPM to Arrive at a Discount Rate

¶71 The calculated estimate of a patent beta along with estimates of the risk free rate (r_f) and the market risk premium (MRP) can be used to determine a patent discount rate.

¶72 The appropriate risk free rate estimate should align with a government bond yield having a maturity similar to the time horizon of the projected cash flows for the asset being valued.[123] In this instance, the appropriate risk free rate equals the return on a ten-year government bond. Despite the fact that patents enjoy a life of 20 years from filing,[124] based on discussions with practitioners and in the authors' experience, the useful economic life of a patent in the technology space lasts approximately ten years. This stems from the pace of technological advancement. For example, the cell phone and computer you used ten years ago are likely much different than those you use today. Indeed, InterDigital's literature supports this time horizon in that it estimates the useful

[120] *See generally* WRDS, *supra* note 115; ACACIA, *supra* note 110.
[121] *See generally* WRDS, *supra* note 115; INTERDIGITAL, *supra* note 112.
[122] KOLLER, *supra* note 69, at 312–13. This formula implies that the beta of InterDigital's debt is very low, i.e., 0. We assume this for simplicity because InterDigital's debt to equity ratio is very low (approx. 3%) and because debt holders enjoy a superior position to equity holders in the capital structure. More sophisticated estimates of unlevered beta exist, however. *See* HOLTHAUSEN, *supra* note 104, at Ch. 14.6.
[123] KOLLER, *supra* note 69, at 296. *See also* HOLTHAUSEN, *supra* note 104, at Ch. 11.11.
[124] 35 U.S.C. § 154(a)(2) (2006).

economic life of its patents at fifteen years.[125] The yield on the ten-year government bond is 3.472% as of this writing.[126]

¶73 The estimate of the market risk premium stems from the selection of the broader market chosen to calculate estimates of beta (in this example, the S&P 500). Various sources provide various historical market risk premiums for the S&P 500, and the Brealy Myers & Allen financial textbook confirms the impossibility of measuring the market risk premium with precision.[127] A survey of financial literature provides historical ranges (dating back to 1900 or 1926, depending on the source) of 5.5% to 7.6%.[128] In the present example we use 5.6% as an estimate for the historic market risk premium.

EXHIBIT 8: CAPM INPUTS.

R_f (10Y Gov't Bond)	Beta	MRP (Historic)
3.472%	1.19596	5.6%

Plugging the above inputs into the capital asset pricing formula discussed above, the resulting discount rate for income generated directly from patent assets, *per se*, equals **10.17%**.

CASE STUDY: U.S. PATENT NO. 5,787,449.

Case Study: U.S. Patent No. 5,787,449 **Analysis of Claim 14**
The case study will use the calculated patent discount rate of **10.17%** to discount the calculated royalty revenue stream.

The case study will use the calculated patent discount rate of 10.17% to discount the calculated royalty revenue stream.

F. Adjust Expected Damages for Idiosyncratic Risk

¶74 Some in the patent transactions market may find this discount rate rather low. Indeed, some practitioners we spoke with indicated they use and have heard suggestions of discount rates of as much as 30% to 40% for patent-generated revenues. Admittedly, this constitutes a rule of thumb approach. To many of those interviewed for this article, however, these values reflect (as best as anyone currently understands) the risks associated with patent-generated cash flows. Despite this, nothing in the first principles

[125] INTERDIGITAL, *supra* note 112, at 73 (InterDigital suggests a patent has a 15 year life.).

[126] *Stock Market & Financial Markets Overview*, BLOOMBERG (Nov. 2009), http://www.bloomberg.com/markets/.

[127] BREALEY, *supra* note 104, at 214–15.

[128] *See, e.g., id.* (quoting 7.6%); KOLLER, *supra* note 69, at 302–03 (quoting 5.5%); HOLTHAUSEN, *supra* note 104, at Ch. 11.10 (quoting 5.6% for long term government bonds and 6.1% for intermediate government bonds).

of finance provides for anything in the discount rate other than market risk.[129] All other risks stem from idiosyncratic risk, which the discount rate does not account for.[130] To adjust for such risks, the more appropriate methodology is to adjust the cash flows based on risk-adjusted expected values.

¶75 Specific to this proposed method, which is based on patent litigation as a backdrop, patent litigation success rates should be used to determine the expected value of the patent-generated cash flows discussed earlier. Studies have demonstrated success rates of between 30% and 40% for patents at trial (including validity and infringement).[131] Although some studies place the success rate at 50%, a closer look shows that these studies count a finding of a patent being infringed but invalid, as a "win" for both the patent owner and the defendant. [132] As any patent owner knows, an infringed but invalid finding is hardly a win. Thus, the lower 30% number seems a fitting conservative adjustment (multiplying each expected cash flow by .3) for any expected future cash flows.

CASE STUDY: U.S. PATENT NO. 5,787,449.

Case Study: U.S. Patent No. 5,787,449

Analysis of Claim 14

Adjusting the calculated royalty revenue stream by the 30% trial success rate yields the following idiosyncratically adjusted royalty stream:

Risk Adjustment	30%				1	2	3	4	5	6
Year	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	
Adjusted Expected Revenue Stream	$ 32.87	$ 37.78	$ 37.71	$ 39.48	$ 41.32	$ 43.26	$ 45.28	$ 47.40	$ 28.78	

G. Discount the Idiosyncratically Adjusted Damages Award by the Discount Rate to Arrive at a Net Present Value (NPV)

¶76 The final step involves discounting the idiosyncratically adjusted expected cash flows by the calculated discount rate. Doing so yields a net present value (NPV) for the patent in question, which transforms the future revenue stream into a single value in today's dollar terms. The calculation sums the discounted cash flows to arrive at a value in today's dollars by using the following formula:

$$\text{NPV} = \sum_{t=1}^{n} \frac{CF_t}{(1+\text{DR})^t}$$

[129] Interview with Prof. Robert Holthausen, The Nomura Securities Co. Professor; Professor of Accounting and Finance; Chairperson, Accounting Department, The Wharton School, University of Pennsylvania (Nov. 2009).

[130] *Id.*

[131] LEVKO, *supra* note 5, at 12.

[132] *See, e.g.*, Jean O. Lanjouw & Mark Schankerman, *Protecting Intellectual Property Rights: Are Small Firms Handicapped?*, 47 J.L. & ECON. 45, 54 n.22, 59 (2004).

In the above formula,

- NPV = Net Present Value;
- t = unit of time (typically years);
- CF = cash flow; and
- DR = discount rate.

This NPV constitutes the value of the patent based on future expected royalty streams. Amounts attributable to past damages could also be added to this NPV number to arrive at a total value.

CASE STUDY: U.S. PATENT NO. 5,787,449.

Case Study: U.S. Patent No. 5,787,449

Analysis of Claim 14

Using 2009 as Year 0 in the NPV calculation and discounting projected, idiosyncratically adjusted, cash flows through July of 2015 using the calculated discount rate and a royalty rate of 5%, yields an NPV of $178.3 million. Adding the past damages from 2007 to 2009 to this number yields a total valuation for this patent at $286.63 million. Note that this constitutes a floor in that other manufactures could also infringe, which would yield a higher valuation number.

Discount Rate	10.17%										
Risk Adjustment	30%					1	2	3	4	5	6
Year		**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Adjusted Expected Revenue Stream		$ 32.87	$ 37.78	$ 37.71	$ 39.48	$ 41.32	$ 43.26	$ 45.28	$ 47.40	$ 28.78
Discounted Revenue					$ 35.83	$ 34.05	$ 32.35	$ 30.74	$ 29.21	$ 16.10
NPV				$ 178.27						
Total Including Past (2007-2009) Infringement				$ 286.63						

Performing a sensitivity analysis using royalty rates of 2% and 7% yields valuations of $114.65 million and $401.29 million, respectively.

As discussed above, this patent endured the gauntlet of district court and appellate litigation. This analysis was conducted turning a blind eye to those proceedings so as not to taint the analysis, but would serve as a useful comparison subsequent to the analysis put forth in this article. The Federal Circuit upheld a $200 million damages award against Microsoft, [133] which is within the range proposed by the valuation methodology suggested by this article.

VII. CONCLUSION

¶77 To determine the most accurate value of a patent, one must not ignore the claims. Thus, any method arrived upon by the market should incorporate an analysis of this all-important aspect of patents. In combining aspects of patent law, technology, and finance theory, the valuation methodology proposed by this article attempts to incorporate patent

[133] i4i Ltd. P'ship v. Microsoft Corp., 598 F.3d 831, 839 (Fed. Cir. 2010).

claims analysis in an attempt to arrive at a more accurate determination of patent value. At the outset of any patent valuation effort, one should determine the scope of the patent claims. *Upon completing this all-important step, one can then more accurately determine* which products (if any) fall within the scope of the patent claims. After determining both the revenues associated with the covered products and the appropriate royalty rate, one can then forecast future cash flows associated with the covered products. Discounting those future cash flows at a patent-specific discount rate will yield an accurate valuation. The article also, using the first principles of finance, arrives at a discount rate for patents, *per se* for use in the valuation determination.

APPENDIX A

Appendix A

Cover Page of U.S. Patent No. 5,787,449

US005787449A

United States Patent [19]

Vulpe et al.

[11] **Patent Number: 5,787,449**

[45] **Date of Patent: Jul. 28, 1998**

[54] **METHOD AND SYSTEM FOR MANIPULATING THE ARCHITECTURE AND THE CONTENT OF A DOCUMENT SEPARATELY FROM EACH OTHER**

[75] Inventors: **Michel J. M. G. Vulpe; Stephen P. Owens**, both of Toronto, Canada

[73] Assignee: **Infrastructures for Information Inc.**, Toronto, Canada

[21] Appl. No.: **253,263**

[22] Filed: **Jun. 2, 1994**

[51] **Int. Cl.**[6] **G06F 17/00**

[52] **U.S. Cl.** **707/513**

[58] **Field of Search** 395/145–149, 395/155–161, 600, 400, 761, 762, 766, 772–778, 779, 784–786; 707/500, 501, 505–508, 511–516, 517, 522–524

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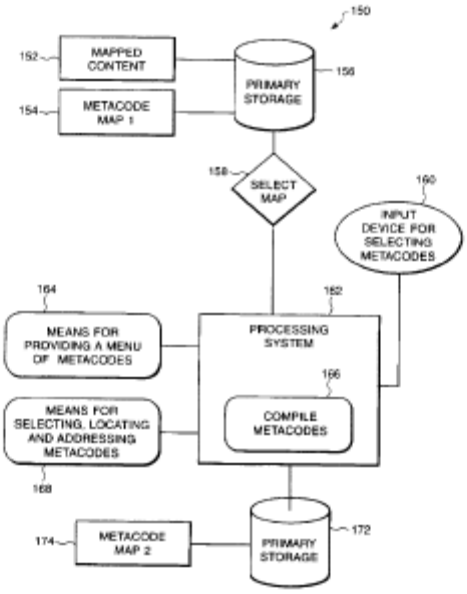
Primary Examiner—Almis R. Jankus

Attorney, Agent, or Firm—Pillsbury Madison & Sutro LLP

[57] **ABSTRACT**

A system and method for the separate manipulation of the architecture and content of a document, particularly for data representation and transformations. The system, for use by computer software developers, removes dependency on document encoding technology. A map of metacodes found in the document is produced and provided and stored separately from the document. The map indicates the location and addresses of metacodes in the document. The system allows of multiple views of the same content, the ability to work solely on structure and solely on content, storage efficiency of multiple versions and efficiency of operation.

20 Claims, 9 Drawing Sheets



APPENDIX B.[134]

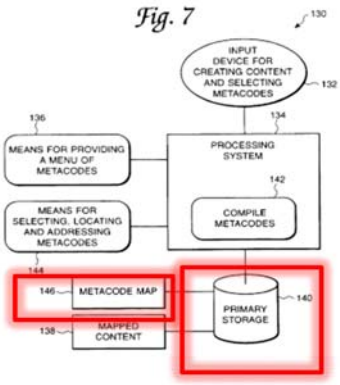
Appendix B Claim Chart Re U.S. Patent No. 5,787,449 and Microsoft Word 2007 XML Format		
Claim 14	**Specification Support**	**Subject Device**
A method for producing a first map of metacodes and their addresses of use in association with mapped content and stored in distinct map storage means, the method comprising:	The invention does not use embedded metacoding to differentiate the content of the document, but rather, the metacodes of the document are separated from the content and held in distinct storage in a structure called a metacode map, whereas document content is held in a mapped content area. Raw content is an extreme example of mapped content wherein the latter is totally unstructured and has no embedded metacodes in the data stream. A metacode, which includes but is not limited to a descriptive code, is an individual instruction which controls the interpretation of the content of the data, i.e., it differentiates the content. A metacode map is a multiplicity of metacodes and their addresses associated with mapped content. An address is the place in the content at which the metacode is to exert its effect. Col. 4, lines 5-20.	*Word 2007's XML file format divides documents into "document parts" including document content (described as the main document body) and metacodes (described as "relationship items" and "content types"). These document parts, including the "relationship items" and "content types," i.e. the map of metacodes, are stored in distinct, non-temporary, storage locations.* Walkthrough: Word 2007 XML Format **Statistics** Annotations **(0)** Click here to expand **Walkthrough: Word 2007 XML Format** Erika Ehrli, Microsoft Corporation June 2006 Applies to: 2007 Microsoft Office System, Microsoft Office Word 2007 **Summary**: Walk through the new default file format for Microsoft Office Word 2007. Read detailed descriptions of the file format architecture, key components, and ways in which you can programmatically modify content. (22 printed pages)

[134] For support for all of the Word 2007 XML information, see Erika Ehrli, *Walk Through Word 2007 XML Format*, MICROSOFT DEVELOPERS NETWORK (June 2006), http://msdn.microsoft.com/en-us/library/bb266220.aspx#office2007wordfileformat_separatingcontentfromthedocument.

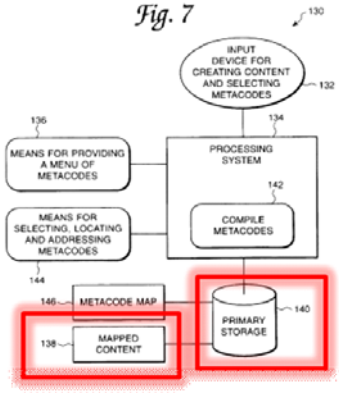
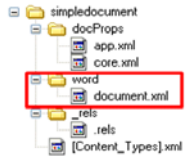
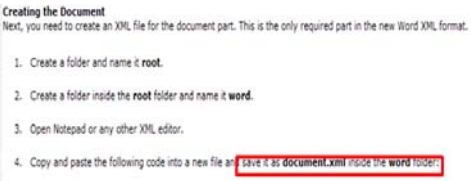
Appendix B
Claim Chart Re U.S. Patent No. 5,787,449
and Microsoft Word 2007 XML Format

Claim 14	Specification Support	Subject Device
A method for producing a first map of metacodes and their addresses of use in association with mapped content and stored in distinct map storage means, the method comprising:	In a further aspect the invention provides a method for producing a first map of metacodes and their addresses of use in association with mapped content and stored in distinct map storage means; Col. 5, lines 36-39. A processing system, shown as Box **12**, generates a menu of metacodes through the instructions for providing a menu of metacodes shown as Box **14**. Col. 13, lines 20-22; Fig. 1. FIG. **7** shows generally as **130** a system and process for creating a new document having a metacode map and associated mapped content. The system has an input process, shown as Box **132**, which produces content and selects metacodes for use with the content. An example of such an input process would be a computer monitor and keyboard combined with a human operator. Col. 14, lines 12-18; Fig. 7. ***Means Plus Function:*** *The corresponding structure for the “map storage means” recited in the claims is the metacode map storage, labeled 140, stored in primary storage, labeled 140, of Fig. 7:* The output of this compilation process is a metacode map which is stored in primary storage, represented by Box **140**, in metacode map storage represented by Box **146**. Col. 14, lines 28-31; Fig. 7	The new file format in Word 2007 solves these issues by dividing the file into *document parts*, each of which defines a part of the overall contents of the file. When you want to change something in the file, you can simply find the document part you want, such as the header, and edit it without accidentally modifying any of the other XML-based document parts. Similarly, all custom XML data is in its own part. Working with customer XML is now easier. This allows you to generate documents programmatically with less code. In addition to being more robust and making it easier to work with custom XML, the new file format is also much smaller than the binary file format. The new file format takes advantage of ZIP technology by using the Open Packaging Conventions. This article walks through the structure of a Word 2007 document in this new file format. *As discussed above, the XML format stores document parts, including mapped content and metacodes, in distinct storage locations:* Word represents each of these document parts with an individual file within the package. These parts can consist of XML files, such as the document parts that contain the markup for the Word XML format, as well as attached contents, such as pictures or OLE-embedded files in their native format. All of these are contained within the package. However, it is important to note that, with a few exceptions defined within the Open Packaging Conventions, the actual file directory structure is arbitrary.

Appendix B
Claim Chart Re U.S. Patent No. 5,787,449
and Microsoft Word 2007 XML Format

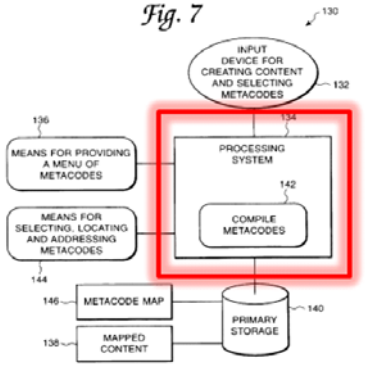
Claim 14	Specification Support	Subject Device
A method for producing a first map of metacodes and their addresses of use in association with mapped content and stored in distinct map storage means, the method comprising:		**Word 2007 Document Parts** To facilitate construction, assembly, and reuse of Word 2007 documents by third-party processes and tools, Word divides the contents of the package into several logical parts that each store a specific document part, for example: • Comments • Style definitions • List definitions • Headers • Charts • Diagrams • The main document body • Images **Mapping Document Parts with Content Types** Every XML file in the file format is a document part. If you look inside the newly-formatted file of most Word files, within the directory structure you see files, or document parts, like `/word/fontTable.xml` and `word/styles.xml`. These files contain clear names that indicate their purpose (for example, font table and style parts). However, you can also change their names. Therefore, inside the [ContentTypes].xml file is a `<Types>` element that maps each content part with its respective content type. *The "relationship items" and "content types" serve as the "map of metacodes" recited in the claims in that they describe how content of a document fits together structurally. These items are stored (non-temporarily) in a file folder called "_rels" distinct from the storage location of the document content itself (stored in the "word" folder):*

Appendix B
Claim Chart Re U.S. Patent No. 5,787,449
and Microsoft Word 2007 XML Format

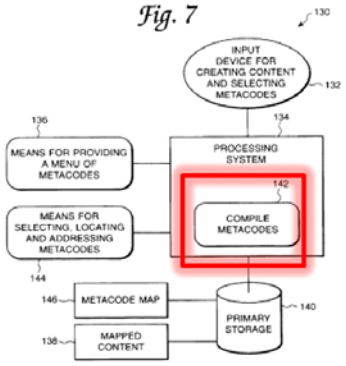
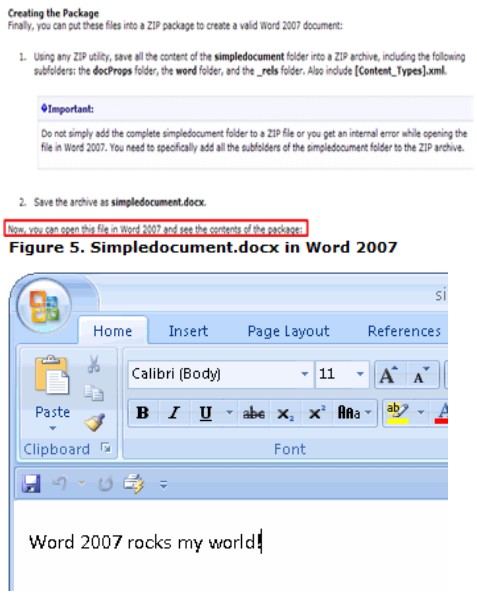
Claim 14	Specification Support	Subject Device
providing the mapped content to mapped content storage means;	Content input from the input process represented by Box 132 is written to mapped content storage, represented by Box 138 and is stored in primary storage represented by Box 140. Col. 14, lines 20-23; Fig. 7. ***Means Plus Function:*** *The corresponding structure for the "mapped content storage means" recited in the claims is the mapped content storage, labeled 132, stored in primary storage, labeled 140, of Fig. 7:* *Fig. 7*  	*The mapped content, i.e., the substance as opposed to the formatting of a document, is provided to a file entitled "word," which serves as the mapped content storage means as recited in the claim. In the example provided by Microsoft, the mapped content includes the phrase "Word 2007 rocks my world!" This mapped content is stored in the "word" folder:* **Figure 4. Folder and file structure for a Word 2007 document**   **Creating the Document** Next, you need to create an XML file for the document part. This is the only required part in the new Word XML format. 1. Create a folder and name it **root**. 2. Create a folder inside the **root** folder and name it **word**. 3. Open Notepad or any other XML editor. 4. Copy and paste the following code into a new file and save it as **document.xml** inside the **word** folder: 

Appendix B
Claim Chart Re U.S. Patent No. 5,787,449
and Microsoft Word 2007 XML Format

Claim 14	Specification Support	Subject Device

providing a menu of metacodes; and	The processing system, shown as Box **134**, produces a menu of metacodes to select from using the instructions provided in Box **136**.
	
	Col. 14, lines 18-20; Fig. 7.
	
	Fig. 7
	
	
		The example provided by Microsoft goes on to state that a relationship among the mapped content items must be created along with a description of the type of content created (for example, a jpeg image or Word text). This combination serves as the menu of metacodes as recited in the claim, which describes the structure and formating of a document:
		
		Creating a Relationship
		Next, you need to create a relationship to this part. This relationship is documented in the root _rels folder, which means that the relationship is off the root (or start part) of the package. To create the relationship:
		
		1. Create a folder inside the folder **root** and name it **_rels**.
		
		2. Open Notepad or any other XML editor.
		
		3. Copy and paste the following code into a new file and save it as **.rels** inside the **_rels** folder:
		
		Xml Copy Code
		`<?xml version="1.0" encoding="UTF-8" standalone="yes"?>`
		`<Relationships xmlns="http://schemas.openxmlformats.org/package/2006/relationships">`
		`<Relationship Id="rId3" Type="http://schemas.openxmlformats.org/officeDocument/2006/relationships/extended-properties" Target="docProps/app.xml"/>`
		`<Relationship Id="rId2" Type="http://schemas.openxmlformats.org/package/2006/relationships/metadata/core-properties" Target="docProps/core.xml"/>`
		`<Relationship Id="rId1" Type="http://schemas.openxmlformats.org/officeDocument/2006/relationships/officeDocument" Target="word/document.xml"/>`
		`</Relationships>`
		
		4. Notice that this XML creates a relationship of type **officeDocument** with ID **rId1** to the **document.xml** file in the folder named word.
		
		Defining the Content Type
		Next, you need to define the content type of this file.
		
		1. Note that the structure of a content type definition file looks like the following:

Appendix B
Claim Chart Re U.S. Patent No. 5,787,449
and Microsoft Word 2007 XML Format

Claim 14	Specification Support	Subject Device
compiling a map of the metacodes in the distinct storage means by locating, detecting and addressing the metacodes; and	Metacodes selected at the input process, represented by Box **132**, are fed to a process, represented by Box **142**, which compiles the selected metacodes using the means for selecting, locating, and addressing metacodes represented in Box **144**. Col. 14, lines 24-28; Fig. 7. *Fig. 7*  By "detecting" is meant recognizing, identifying or differentiating a metacode from content; by "locating" is meant finding the position of a metacode in and relative to an input content stream; and by "addressing" is meant forming a unique identifier which defines the position of a metacode relative to the mapped content stream. Col. 4, lines 36-41. ***Prosecution Amendment:*** *the language "by locating, detecting, and addressing said metacodes" was added to the claim during prosecution to overcome prior art and to further characterize the meaning of "compiling." The applicant distinguishes "compiling" as used in computer programming, i.e. generating object code from source code from its use in the claim, i.e., locating, detecting, and addressing*	*When Word 2007 opens a document stored in this XML file format, it has the ability to comple the map of metacodes by locating, detecting, and addressing the metacodes in that when it opens the document described in the example, it successfully opens the document reading "Word 2007 rocks my world!" with the appropriate formatting:* 

Appendix B
Claim Chart Re U.S. Patent No. 5,787,449
and Microsoft Word 2007 XML Format

Claim 14	Specification Support	Subject Device
providing the document as the content of the document and the metacode map of the document.	Delivering a complete document would entail delivering both the content and a metacode map which describes it. Col. 4, lines 23-24. By the term "document" as used in this specification is meant a non-random aggregation of data irrespective of its mode of storage or presentation. Col. 4, lines 56-58. ***Prosecution Amendment:*** *this limitation was added to the claim during prosecution to overcome prior art and to further characterize the invention as teaching storing a document as individual parts including content and metacodes as opposed to a single unit including both content and embedded metacodes. File History, Jul. 1, 1997 Amendment, pp.3-4; 7-8.*	*The various parts of a document in the Word 2007 XML file format are stored in a file entitled the "container file," which includes the various parts of a document including the content of the document and the metacode map (relationship part and content type) of the document. The contents of the container file, when aggregated, compose the entire document including both content and structure/formatting:* For example, in Word 2007, the container file represents a document. Within the container file, there are parts that, when aggregated, compose the document. For example, a Word 2007 file could contain (but is not limited to) the following folders and files: • **[Content_Types].xml.** Describes the content type for each part that appears in the file. • **_rels folder.** Stores the relationship part for any given part. • **.rels file.** Describes the relationships that begin the document structure. Called a *relationship part*. • **datastore folder.** Contains custom XML data parts within the document. A custom XML data part is an XML file from which you can bind nodes to content controls in the document. • **item1.xml file.** Contains some of the data that appears in the document. Example of a custom XML data part. • **docProps folder.** Contains the application's properties parts. • **App.xml file.** Contains application-specific properties. • **Core.xml file.** Contains common file properties for all files based on the Open