ARTICLE

EVERYTHING OLD IS NEW AGAIN: OBVIOUSNESS LIMITATIONS ON PATENTING COMPUTER UPDATES OF OLD DESIGNS

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Patent law rewards the discovery and disclosure of inventions that are new, useful, and nonobvious advances.[1] Patent rights are not available for new advances that are merely obvious extensions or modifications of prior designs.[2] These obvious advances are treated as unpatentable discoveries to avoid placing patent restrictions on inventions that would be likely to be developed and disclosed without the lure of patent rights.[3] The incentives of patent rights are reserved for the encouragement of exceptional developments that are unlikely to emerge spontaneously through the application of ordinary, widely held engineering skill.[4]

The nature of exceptional or "nonobvious" advances meriting patent incentives is constantly in flux as our understanding of prior designs grows and the level of widely held skill in engineering domains rises.[5] Often, as a field matures, its accumulated history of designs provides ever increasing knowledge about possible design approaches. At the same time, the skills of practitioners in the field improve and facilitate new methods for expanding or modifying existing designs.[6] The result is that more and more new designs fall

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1 35 U.S.C. §§ 101-103 (2000); Giles S. Rich, *Principles of Patentability,* 28 GEO. WASH. L. REV. 393, 402-07 (1960).

2 35 U.S.C. § 103 (2000).

3 Rich, *supra* note 1, at 399.

4 *See id.*

5 Tests for an invention's obviousness are premised on the view that obvious, patentable inventions are those which are just out of reach to the average practitioner having commonly held skills in the field of the invention and full access to the prior art in the same or related fields that might inspire the new design ideas. As the prior art in various fields and the design skills of practitioners improve, the reach of practitioners to develop new innovations improves as well. Therefore, the domain of what is considered obvious and unpatentable constantly evolves with changes in accumulated prior art information and enhancements in commonly held design skills. *See* Wire Wheel Corp. of America v. C.T. Silver, Inc., 266 F. 221, 227 (S.D.N.Y. 1919) (Hand, J.) (describing the inquiry into the proper scope of patentable inventions as "an attempt to reconstruct the scope and limits of imagination of the ordinary skilled man"), *aff'd*, 266 F. 229 (2d Cir. 1920).

6 *See* Dennis S. Karjala, *The Relative Roles of Patent and Copyright in the Protection of Computer Programs*, 17 J. MARSHALL J. COMPUTER & INFO. L. 41, 66 (1998) (noting that with the maturity of computer programming as an engineering art, there may be few, nonobvious new ways of organizing or structuring programs that will qualify for a patent based on the structure, sequence, or organization of the programming alone).

within the bounds of obvious extensions of prior designs and are therefore unpatentable subject matter.[7]

The development of computer updates to earlier device and process designs presents an exception to this pattern and creates a range of troubling issues for patent law. Computer updates of earlier designs have roots in both programming technologies and in the technologies of the devices or processes being updated. Computer software designed to update practical devices and processes raises distinctive patent law issues because this software is frequently a complex mixture of old and new design elements drawn from multiple design fields.[8]

In addition, it is often difficult to identify how much is new in software designs based on earlier physical devices or processes. Significant aspects of these computer updates are old and derivative in that they replicate information processing features of the past devices or processes, yet other components of the updates are new and original in their added information organization and processing details.[9]

This blend of old and new creates complex patent enforcement controversies as courts, Patent Office[10] officials, patent holders, and potential infringers all seek to determine the validity and scope of patents covering new software and related business methods.[11] Should these advances be seen as narrow modifications of old designs incorporating earlier pre-computer information processing methods augmented in obvious ways by a few widely understood

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7 *See id.* Patent law still has an impact in these mature fields by encouraging fundamentally new approaches to old device or process designs that will produce substitutes for products or processes produced through earlier, well understood design approaches. This search for new designs that are sufficient departures from traditional designs to be patentable can occur at the level of overall device designs or at the level of device subcomponents. However, the breadth of traditional knowledge in these fields means that this knowledge will be sufficient to resolve most practical design problems and that significantly different, patentable departures from existing design approaches will be rare.

8 One good example of this type of mixture of old and new in computer updates is the online shopping advance at issue in recent litigation between Amazon.com and Barnesandnoble.com. *See* Amazon.com, Inc. v. Barnesandnoble.com, Inc., 239 F.3d 1343 (Fed. Cir. 2001) (vacating the preliminary injunction imposed in Amazon.com, Inc. v. Barnesandnoble.com, Inc., 73 F. Supp. 2d 1228 (W.D. Wash 1999)). The advance at issue in this case involved a computer-implemented customer information and purchasing record system that allowed an online customer to finalize the purchase of an item with "one click" of a computer mouse. The design for this advance was based on earlier purchasing processes used in physical stores such as supermarkets or drugstores. However, key features of the new online purchasing system reflected the addition of software-mediated means for the storage and processing of purchase information. *See infra* text accompanying notes 104-11.

9 *See, e.g.*, *Amazon.com*, 239 F.3d at 1343.

10 For convenience, the United States Patent and Trademark Office will be referred to here as the "Patent Office" or "PTO."

11 *See, e.g.*, *Amazon.com*, 239 F.3d at 1343.

computer processing techniques? Such a characterization would render these computer updates of old designs largely unpatentable.[12] Or, should the features of computer update designs through which the particular strengths of computer-enhanced information processing are used to rearrange and augment prior information processing methods be seen as sufficiently unprecedented and distinct from prior designs to make the resulting computer updates nonobvious and patentable? In short, where the heritage of a software-based innovation lies in both the software world and the application field of the innovation, how should the obviousness of the invention be judged?

These questions promise to figure in an approaching wave of software and business method patent litigation. This wave is poised to hit federal courts over the next decade as the delayed consequences of recent changes in patent law standards are translated into patent enforcement actions and controversies. Over the past decade, federal courts have significantly clarified and expanded standards governing software and business method patents.[13] Following a period of doubt about the patentability of software and business method advances,[14] patent law standards now extend protection to these sorts of advances and treat innovative software and business methods similarly to more traditional types of physical engineering advances.[15] The result has been a surge in software and business method patent applications submitted to the Patent Office in recent years.[16] Once issued, software and business method patents resulting from this surge in applications promise to create a corresponding wave of federal litigation (and related patent licensing negotiations) as attempts are made to enforce the patents.[17]

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12 *See* 35 U.S.C. § 103 (2000).

13 *See, e.g.*, State Street Bank & Trust Co. v. Signature Fin. Group, 149 F.3d 1368, 1375 (Fed. Cir. 1998).

14 For a description of the history of these standards and their present scope, see Richard S. Gruner, *Intangible Inventions: Patentable Subject Matter for an Information Age*, 35 LOYOLA L.A. L. REV. 355, 382-97 (2001).

15 Under current standards, an invention constitutes patentable subject matter if it entails a specific machine, material, or process that produces a useful, concrete, and tangible result. *In re* Alappat, 33 F.3d 1526, 1544 (Fed. Cir. 1994). It is not important whether an advance would be considered a traditional type of "process, machine, manufacture or composition of matter" as those terms were understood by Congress in enacting the present patent statute. Rather, the question of whether a claimed invention constitutes patentable subject matter turns on "the essential characteristics of the subject matter, in particular, its practical utility." *State Street Bank*, 149 F.3d at 1375.

16 *See* William D. Wiese, *Death of a Myth: The Patenting of Internet Business Models After* State Street Bank, 4 MARQ. INTELL. PROP. L. REV. 17, 27-29 (2000).

17 Several commentators have argued that this coming wave of patent enforcement litigation will be so injurious to software development and business competition that software and business method advances should be treated as unpatentable subject matter under special standards. *See, e.g.,* Rochelle Cooper Dreyfuss, *Are Business Method Patents Bad For Business?,* 16 SANTA CLARA COMPUTER & HIGH TECH. L.J. 263, 267 (2000); Leo J. Raskind, *The* State Street Bank *Decision: The Bad Business of Unlimited Patent Protection*

Controversies regarding the obviousness of computer updates revisit a long-standing set of patent law issues regarding the obviousness and patentability of inventions built from combinations of old elements. Patents on these sorts of combinations, sometimes termed "combination patents," have traditionally been suspect because of doubts about the degree of original design effort needed to bring together component parts that were already known and understood in the same design field.[18] Courts have frequently viewed the act of linking together parts that were already known in the same design field as an obvious step resulting in an unpatentable invention.[19]

However, not all inventions involving combinations of old elements have been seen as unpatentable. Courts have been willing to recognize combinations of old elements as patentable subject matter where the combinations exhibit unexpected functionality.[20] Hence, current controversies over combination patents focus on both the obviousness of combining known elements and on the unpredictability of the functional results of those combinations.[21] This suggests that computer updates will be sufficiently nonobvious designs for patenting if they entail combinations of old and new

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for Methods of Doing Business, 10 FORDHAM INTELL. PROP. MEDIA & ENT. L.J. 61, 64 (1999).

I have argued elsewhere that this solution is too extreme and will improperly withhold valuable patent incentives encouraging software development and public access to computer-implemented information processing advances. *See* Richard S. Gruner, *Better Living Through Software: Promoting Information Processing Advances Through Patent Incentives*, 74 ST. JOHN'S L. REV. 977, 998-1028 (2000). This article argues that the negative social impacts of software and business method patents can be adequately contained without eliminating patent incentives for important software and business method advances altogether. This can be achieved, it is argued, if courts adopt improved obviousness standards for separating routine, unpatentable advances from exceptional, patentable ones. *See infra* text accompanying notes 271-77.

18 Suspicion about the obviousness of inventions comprised of combinations of previously known elements at one time resulted in special patentability tests for these inventions. *See, e.g.,* Sakraida v. Ag Pro, Inc., 425 U.S. 273, 281-82 (1976) (requiring that a combination of old elements achieve "synergy" in order to be patentable). However, these special tests have since been rejected in favor of applying normal invention obviousness tests, but with special scrutiny of whether the prior knowledge of sub-elements of an invention would have rendered the combination obvious. *See, e.g.,* Raytheon Co. v. Roper Corp., 724 F.2d 951, 961 (Fed. Cir. 1983), *cert. denied*, 465 U.S. 835 (1984).

19 *See In re* Dillon, 919 F.2d 688, 692-93 (Fed. Cir. 1990) (en banc) (holding that where an invention sought to be patented was structurally similar to a combination of elements present in the prior art, the invention was presumed to be an obvious extension of the prior art and unpatentable; this presumption – based on structural similarity – could be overcome by evidence that either the prior art would have provided no motivation to make the combination or that the combination had unexpected functional characteristics).

20 *See id*. (noting that evidence of unexpected functionality can overcome the presumption of the obviousness of combinations of known elements).

21 *Id.*

elements that would not have been obvious to pursue or, if obvious to pursue, would not have been foreseen to have the functionality actually achieved.

Computer updates of older physical devices and processes have raised new patentability issues beyond the concerns raised by combination patents. The flexibility and power of computer programming techniques make combinations of old and new design elements and adjustments of those combinations particularly fluid and easy to implement.[22] The result is that new software-enabled combinations differ from earlier combinations of known physical elements in certain critical respects. These differences include: 1) numerous designs involving new combinations of large numbers of previously known software and hardware elements, 2) subtle degrees of originality in designs replacing hardware components with computer-based equivalents, 3) great diversity in the types of programmers and application domain specialists who are producing new computer update designs, 4) numerous application fields providing background design information for these updates, and 5) widely varying applications for which computer updates have been developed and sought to be patented. These sorts of distinctive features of computer updates have raised equally distinctive problems in determining the obviousness and patentability of these updates.

This article examines the unusual obviousness and patentability questions posed by computer updates of practical devices and processes. It argues that a new approach to evaluating the obviousness and patentability of these inventions is needed. The analyses presented here treat recent litigation involving Amazon.com and Barnesandnoble.com as a paradigm example of the types of patent rights and business controversies that soon will increase as more patents on computer-implemented devices and practices are enforced.

This litigation is examined from three perspectives. First, the patent validity analyses undertaken by the district and appellate courts in this case are analyzed in detail to illustrate how some of the distinctive features of computer updates have caused courts special difficulties in assessing the obviousness of such updates. Second, an improved method for evaluating the obviousness of these types of advances is proposed and the invention at issue in this litigation is reevaluated under this proposed standard. Third, the judicial evaluations in this litigation and the evaluations under the proposed standard are compared to identify several advantages of the proposed approach as a means for evaluating the obviousness of computer updates of older devices and processes.

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22 The flexibility of design structures and ease of adjustment along a continuum of design alternatives is typical of new software designs generally. *See* Alan Kay, *Computer Software*, SCI. AM., Sept. 1984, at 3 (noting that software can create diverse types of computer applications by using the strengths of computer-based information processing to mediate between the needs and capabilities of computer users and the practical tasks (such as designing a bridge or writing an article) that computers are to assist).

I. THE PROBLEM IN BRIEF: WHAT MAKES A COMPUTER UPDATE NONOBVIOUS AND PATENTABLE?

A. Distinctive Features of Nonobvious Computer Updates

In specifying patent law standards, courts have struggled to describe why some inventions, although new, useful, and clearly described in patent applications by their inventors, do not qualify for patents.[23] Under present patent law standards, new device, material, and process designs that are "obvious" in light of prior designs are unpatentable.[24] Assuming that other tests for patentability are met, even inventions having modest utility qualify for patent protection and rewards so long as the inventions are nonobvious.[25] By contrast, inventions involving obvious designs are never patentable, even if the inventions are socially important or commercially successful.[26] In short, engineering rarity or atypicality is what makes an invention nonobvious and potentially patentable, not social significance.

In evaluating whether particular inventions have this type of engineering rarity, courts have identified a number of features that separate nonobvious inventions from obvious ones for patent law purposes. This section will briefly review the distinctive features that courts have identified in nonobvious inventions, with particular attention to the ways those features might appear in computer update designs. In addition to describing several invention characteristics that have proven important in identifying nonobvious, patentable inventions, this section will also focus on several criteria for invention obviousness that courts have not deemed important in determining patentability.

1. Likelihood of Routine Development Determines Obviousness

The primary characteristic that courts have looked to in determining the obviousness of a new invention is whether the same invention would have been likely to have been developed by practitioners in the relevant design field using routine design approaches and information about previous designs

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23 For an overview of the evolution of judicial standards governing the unpatentability of routine inventions, see George M. Sirilla, *35 U.S.C. Sec. 103: From* Hotchkiss *to Hand to Rich, the Obvious Patent Law Hall-of-Famers*, 32 JOHN MARSHALL L. REV. 437, 458-557 (1999).

24 *See* 35 U.S.C. § 103 (2000).

25 In general, a patentable design must describe a useful material, device, or process which is 1) novel in comparison with prior, publicly known designs (the "prior art"), 2) a nonobvious advance over designs in the prior art, and 3) the subject of a timely and complete patent application. *See generally* DONALD S. CHISUM, CHISUM ON PATENTS §§ 1.01-6.04 (2000).

26 *See generally* Rich, *supra* note 1 (describing why patentability does not depend on the social or commercial importance of an invention).

known at the time the invention was made.[27] This analysis seeks to project the likely course of design knowledge expansion in the field of design that includes the invention and to determine if normal engineering processes in this field would have been likely to have produced the invention in question without the special incentive of patent rights. The test is aimed at ensuring that patent incentives encourage and reward types of discoveries that are unlikely to be made by practitioners with widely held skills, while at the same time ensuring that the common day-to-day work of those practitioners can go forward unfettered by patent restrictions.[28]

Nonobviousness tests carve out a domain of commonplace discoveries that are not protected by patent rights and that can be developed or copied by all practitioners without concern over whether other parties will possess patent rights limiting the use of the discoveries.[29] The tests also delineate a range of exceptional discoveries beyond the capabilities of most practitioners that are specially encouraged by patent incentives. By separating inventions into these two subcategories, nonobviousness tests ensure that the public benefits from two mechanisms for promoting innovation: (1) free competition for innovation among average practitioners in areas of routine knowledge expansion where such competition is likely to produce new advances, and (2) the further incentives of patent rewards where such additional rewards seem necessary to spark unusual inventive efforts and disclosures.

Beyond these anticipated impacts on innovative efforts, separating inventions for patent law purposes under nonobviousness standards ensures

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[27] *See* American Hoist & Derrick Co. v. Manitowoc Co., 448 F. Supp. 1372, 1382 (E.D. Wis. 1978); Funnelcap, Inc. v. Orion Indus., Inc., 421 F. Supp. 700, 707 (D. Del. 1976); 2 PETER D. ROSENBERG, PATENT LAW FUNDAMENTALS § 9.02[2][a][iii] (2d ed. 2001).

Discovery of an invention by average practitioners is likely where the prior art, as it would be interpreted by a practitioner with average skills, suggests both how to design the invention and the likely success of the invention in solving a practical problem. Under these circumstances, average practitioners would be likely to pursue the invention design, and the invention would be likely to be produced through routine engineering processes. For patent law purposes, this type of invention is considered obvious and unpatentable. *See, e.g.,* Amgen, Inc. v. Chugai Pharm. Co., 927 F.2d 1200, 1209 (Fed. Cir. 1991*)*; *In re* Dow Chemical Co., 837 F.2d 469, 473 (Fed. Cir. 1988).

[28] Practitioners in a particular field are protected in their expectations that designs they develop through routine design methods are not capable of patenting and restriction by other practitioners making similar contemporary discoveries. Discoveries that are capable of being produced through routine engineering efforts would be deemed obvious and unpatentable. *See* Rich, *supra* note 1, at 399.

[29] Of course, there is still some possibility that today's routine discovery was previously made and patented at an earlier time when the discovery was not routine. Under this combination of facts, an earlier patent could constrain the use of a currently routine discovery. However, such a patent would tip off parties in the field that the design approach involved is not freely available for subsequent use until the applicable patent expires, thereby directing practitioners away from the patented design approach if they do not want to risk infringement based on use of the patented design.

that the costs of the patent system — including restrictions on the use of patented inventions and the transactional costs of obtaining and enforcing patent rights — are limited to those inventions in which the public has a particularly strong interest. Nonobviousness standards limit patent system costs to innovations that are not likely to be produced by routine design processes. The public has a particularly strong interest in ensuring that these rare innovations requiring exceptional skills or knowledge are pursued by those few inventors capable of producing them, and that these nonobvious innovations are brought to public attention when discovered. Patent rewards encouraging pursuit of atypical design approaches and patent application standards requiring public disclosures of atypical designs to obtain patents promote the public's strong interest in access to diverse types of innovations.

By contrast, if patent incentives are not needed to encourage the production of certain innovations because the innovations are likely to be created through the routine application of average engineering skills to design problems, then the social costs of patents for these inventions should be avoided. Society will probably gain the same advances without patent rights and costs.

Given these goals, courts have shaped nonobviousness standards to limit patent incentives and restrictions to inventions that would not be predictably successful in the eyes of an average practitioner having full access to information about earlier designs and engineering information in the same field (often referred to collectively as the "prior art").[30] Nonobvious innovations are new solutions to practical problems that are "unexpected in light of the prior art."[31] That is, considering the totality of prior design information in the same field, the design is nonobvious if the prior art available at the time the design is produced does not indicate the design's likely success.[32] Given its unpromising appearance in light of prior art knowledge, such a design is unlikely to be pursued by practitioners having common skills. Patents ensure that inventors with special insights and capabilities are encouraged and rewarded for using their unusual knowledge to look beyond the predictions of most practitioners to develop and disclose invention designs that most practitioners would have ignored.

Hence, the focus in nonobviousness evaluations of computer updates should be on the inventive process and how computer update engineering efforts normally proceed.[33] Computer update designs that are likely to be discovered

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30 *See, e.g., In re* Eli Lilly & Co., 902 F.2d 943, 948 (Fed. Cir. 1990).

31 *Id.*

32 *See id.*

33 All types of inventions are subject to the same nonobviousness standards, in part because boundaries between technology types are sufficiently unclear that courts would have a difficult time applying one standard to one technology and another to a different technology. *See* U.S. Patent and Trademark Office, Public Hearing on the Standard of Nonobviousness (July 20, 1994) (statement of Pasquale A. Razzano, President, New York Intellectual Property Law Association) (arguing that the boundaries between technology types are not specific enough to indicate where special nonobviousness standards should

through these routine processes should be treated as obvious and unpatentable. However, computer updates that incorporate distinctive design insights unlikely to be repeated in normal design processes should be seen as nonobvious inventions. These sorts of nonobvious computer updates will merit patents if they satisfy all other patent law requirements for patent issuance. Rewarding inventors of nonobvious computer updates with patents will help to ensure that society gains the benefit of these exceptional inventions by encouraging greater efforts to produce, disclose, perfect, and popularize this special class of discoveries.

2. Extensive Design Differences are Not Required

In contrast to the likelihood of routine discovery, a number of other invention characteristics have been rejected by courts as indicators of invention obviousness. For example, extensive physical differences between a new invention and previous devices or processes of the same sort is required to establish an invention's nonobviousness. Thus, in the context of computer updates, the mere fact that a computer-enhanced, updated version of a device or process bears a substantial physical similarity to its non-computer predecessors should not, by itself, establish that the update is obvious and unpatentable.

The differences between earlier designs and the design of a new innovation are, indeed, considerations in determining what is new in the invention and what may be a sufficiently nonobvious new feature to qualify the invention for a patent.[34] However, this does not mean that the narrowness of physical or process differences of an invention from prior art designs is enough, standing alone, to indicate that the invention is obvious and unpatentable. Even where a new design entails small structural differences from prior designs, the new design may be a nonobvious discovery if the small differences are unexpectedly successful in achieving some functional result or capability.[35]

Indeed, many efficient and important new designs are ones in which large changes in functionality and utility are achieved through narrow, but critically important, modifications to earlier designs.[36] The patent system does not

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apply) (on file with the author and the Boston University Journal of Science & Technology Law).

34 *See* Graham v. John Deere Co., 383 U.S. 1, 17 (1966).

35 Unexpected utility in new designs that are structurally similar to earlier designs provides evidence that the new designs are nonobvious despite the similarity. *See* DONALD S. CHISUM, INTELLECTUAL PROPERTY: COPYRIGHT, PATENT, AND TRADEMARK 7-103, 7-104 (1980). This reflects the view that it is the nonobviousness of the invention as a whole which governs patentability, including the nonobviousness of the functional results achieved. Where knowledge of prior designs and of principles for projecting the probable functional results of various design changes would not have provided the average designer in the field with grounds to predict the actual functional consequences of a given change, then the changed design was nonobvious and potentially patentable. *See id.*

36 A large increase in utility achieved with minimal structural changes from prior

exclude these types of narrow but functionally important design changes from the encouragement of patent controls and rewards. Hence, a high degree of physical similarity between new and prior art designs — including the structural similarity of older devices and processes to computer updates of the same devices and processes — is not a basis for finding an invention obvious and unpatentable.

3. Differing Functional Results are Not Required

Devices or processes that achieve similar or even identical operating results (such as a device and a computer update of that device that produce similar operating results) can still vary in nonobvious and patentable ways. The similarity of their functional results and consequent social impacts does not necessarily mean that the inner contents of the two devices or processes are similar. Where a party, such as the developer of a computer update, produces a nonobvious new means of achieving an old result, the update is not just an obvious offshoot of the prior devices or processes that produced the same result. New results or incremental utility over prior designs are not required in a patentable invention.[37]

Hence, internally updated or altered product or process designs which achieve the same ends as their predecessors are patentable if the new internal features are nonobvious despite their overall functional similarity.[38] In the context of computer updates, this means that an update that achieves the same or similar functional results to its non-computer predecessors may still be patentable if the means of attaining the same or similar functionality — that is, the new computer processing features added to create the update — are implemented in a nonobvious fashion.

B. Indicators of Invention Obviousness

Courts have identified a number of indicators of the nonobviousness of an innovation under the obviousness standards just described. They have used these indicators to evaluate whether a given invention would have been predictably successful to, and therefore likely to be undertaken by, the average practitioner in the relevant design field at the time of the innovation. This subsection summarizes some of the key considerations and interpretive techniques used by courts in evaluating invention obviousness.

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designs will generally produce a valuable new design. The increased utility will enhance the beneficial impact of the new device or process, while the similarity to its predecessors will generally ensure that the new product is easy to produce and use, or that the new process is easy to complete by persons familiar with the old process.

37 *See* United States Steel Corp. v. Phillips Petroleum Co., 865 F.2d 1247, 1250 (Fed. Cir. 1989) (stating that an invention possess sufficient results and utility to be patentable if the invention has some features capable of benefiting mankind, even if those features involve no incremental utility or commercial value).

38 *See, e.g., In re* Ratti, 270 F.2d 810, 814 (C.C.P.A. 1959).

1. Assembling the Prior Art

A basic premise of invention evaluations under patent law is that the obviousness of an invention should be based on the publicly available knowledge, or "prior art," existing at the time of the invention. Later acquired knowledge should be ignored, as should any knowledge added to the field by the inventor's own work.[39] The likelihood that other practitioners in the field would have extended engineering knowledge to produce the invention should be assessed in terms of the starting point these practitioners would have had — i.e., the publicly available knowledge in the same field at the time of the invention.

Unfortunately, this limitation on obviousness analyses, while logical in purpose, is hard to maintain in application. Two problems arise in trying to partition pre- and post-invention design knowledge in determining nonobviousness. One is that it may be difficult to determine when information about a particular design element or approach became known and available to practitioners. Design knowledge and techniques which seem long-standing at the time of patent enforcement may have a history that is difficult to document and trace back to the pre-invention period.[40]

Second, insights available through hindsight often interfere with a court's ability to objectively assess the nonobviousness of a design. Examining the obviousness of inventions retrospectively, courts and other analysts have a tendency to overestimate both the abilities of practitioners with commonly held skills and the insights that these practitioners would be able to draw from pre-invention prior art.[41] Many successful solutions to design problems seem simple and obvious once they are implemented.[42] Yet, before these solutions were recognized and their simplicity and effectiveness demonstrated, the same design solutions may have been very difficult to discover and, hence, nonobvious to the common practitioner. Efforts to resist hindsight bias strongly flavor judicial analyses in this area, with the result that some courts have required very strong evidence of likely practitioner insights before being willing to find that the inventions based on the insights were obvious.[43]

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39 *See* Funnelcap, Inc. v. Orion Indus., Inc., 421 F. Supp. 700, 707 (D. Del. 1976) (stating that contributions of the inventor should not influence the evaluation of whether an invention was a mere obvious extension of the prior art and therefore unpatentable).

40 In order for information about other designs to be considered in evaluations of the scope and obviousness of new features in an invention, there must generally be evidence that the information was publicly available at the time of the invention. ROSENBERG, *supra* note 27, § 9.02[2][a][i].

41 *See, e.g.,* Uniroyal, Inc. v. Rudkin-Wiley Corp., 837 F.2d 1044, 1051 (Fed. Cir. 1988).

42 "That which may be made clear and thus 'obvious' to a court with the invention fully diagrammed and aided by experts in the field may have been a breakthrough of substantial dimension when first unveiled." ROSENBERG, *supra* note 27, § 9.02[2][b][ii].

43 *See* Sirilla, *supra* note 23, at 457.

2. *Ex Post* Speculations About Hypothetical Discoveries: The Difficulty of Reconstructing Design Processes that Never Occurred

Obviousness inquiries are difficult legal analyses in part because they require courts and fact finders to predict the outcome of design processes that never occurred. An invention is deemed obvious if, looking backward at the level of practitioner skills and engineering knowledge existing at the time of the invention, it appears that other practitioners besides the inventor would have been likely to discover a similar invention.

This analysis is inherently speculative for several reasons. In general, the analysis often calls for speculation about the abilities and inventive practices of a group of practitioners whose skills and knowledge differ significantly from those of the inventor. Typically, the engineering discovery process that produces a patented invention does not occur among practitioners with common skills. Rather, such an invention is developed by someone with extraordinary skills or knowledge. Thus, the evaluation of invention obviousness often turns on the prediction of invention capabilities of common practitioners that are less substantial than those of the inventor. To determine whether common practitioners were likely to have produced innovations like the patented invention, fact finders may need to predict the outcome of hypothetical engineering processes undertaken by common practitioners. These hypothetical processes may differ significantly from the actual path of discovery.

In addition to uncertainty about the hypothetical invention process involved, the information considered by common practitioners in carrying out these processes may be difficult to identify retrospectively. A fact finder evaluating the obviousness of an invention must make an *ex post* reconstruction of the situation of common practitioners at the time of the invention that requires the fact finder to determine and consider only design knowledge entering the field *ex ante* to the time of the invention.

As this inquiry goes forward, the actual design processes leading to the invention are potentially misleading and should be ignored.[44] These processes are excluded from consideration for two reasons. First, as already noted, the new knowledge added to the field by the inventor is properly ignored in the assessment of common practitioners' probable insights because this knowledge would not have been available to common practitioners. Second, the inventor is typically an exceptional engineer or designer whose insights are not representative of the common practitioner's capabilities. As one commentator noted:

> [T]he test for nonobviousness concerns itself not with the actual mental processes whereby an invention was developed but with the degree of difficulty in developing the invention in light of all the prior art. It must be determined whether the hypothetical person having ordinary skill in

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44 *See Funnelcap*, 421 F. Supp. at 707 (noting that contributions of the inventor are properly ignored in evaluating whether an invention is obvious and unpatentable).

> the art would readily have found the same solution when addressing himself to the same problem.[45]

Ultimately, a finding that an invention was obvious and unpatentable requires a fact finder to make two difficult predictions.[46] First, the fact finder must predict that a practitioner in the relevant field with ordinary skills would probably have pursued the design approach[47] and, second, that he or she would have recognized, with reasonable certainty or minimal confirmation effort, that this design approach supplied a successful solution to the practical problem at hand.[48]

3. Specific Indicators of Likely Rediscovery and Obviousness

Courts have identified several types of prior art information[49] that indicate inventions were predictably successful when made and, therefore, obvious and unpatentable.[50] Obvious innovations are indicated by the following types of prior art information.

a. Information Leading Practitioners to the Design

An invention is generally deemed obvious and unpatentable if there was information present in the prior art at the time of the invention indicating that the new design approach adopted in the invention was a candidate for solving the practical problem in question. Prior art information that is publicly available from such sources as printed publications[51] or publicly used devices

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45 ROSENBERG, *supra* note 27, § 9.02. *See also American Hoist & Derrick*, 448 F. Supp. at 1382.

46 Evaluations of invention obviousness involve predictions of behavior because a fact finder must determine what a hypothetical common practitioner would have been likely to have pursued as inventive efforts amidst the state of the prior art as of the date of an invention. Where the predicted inventive efforts of common practitioners seem likely to have produced the same invention even without the discovery by the actual inventor, the invention is deemed obvious and unpatentable. *See* Graham v. John Deere Co., 383 U.S. 1, 17-18 (1966).

47 *See, e.g., Dow Chemical*, 837 F.2d at 473.

48 *Id.*

49 Sources of prior art information include public uses, printed publications, and issued patents disclosing design features of useful devices, materials, or processes. *See* 35 U.S.C. § 102(a) (2000).

50 *See In re* Eli Lilly & Co., 902 F.2d 943, 948 (Fed. Cir. 1990).

51 Prior art considered in obviousness analyses includes printed publications that were publicly available at the time of a patented invention. *See, e.g.,* Massachusetts Inst. of Tech. v. AB Fortia, 774 F.2d 1104, 1108-09 (Fed. Cir. 1985) (finding that a paper delivered at a conference in another country was a printed publication and part of the prior art considered in patent analyses where 1) prior to the conference the author gave a copy of the paper to the head of the conference, 2) between 50 and 500 persons working in the pertinent field attended the conference, and 3) copies of the paper were distributed on request, without restriction, to at least six persons).

or procedures[52] will render an invention obvious and unpatentable if the information:

1) Suggested the same overall design approach as was adopted in the invention;[53]

2) Indicated the new design approach used in the invention would supply some functional feature needed in a practical task or component of such a task, providing the average designer with motivation to try the design approach;[54] or

3) Described scientific or engineering principles permitting rational extrapolation or optimization of prior art designs to produce the new features of the invention.[55]

Even where a new design approach adopted in an invention was suggested or motivated by the prior art, or capable of derivation through rational application of well established design principles, knowledge must also have existed in the prior art of recognized techniques for carrying out the proposed invention.[56] In other words, an invention that is obvious in ideal form may still be nonobvious because the means of implementing it in a practical design involve nonobvious implementation steps or technologies.[57]

b. Evidence of Predictable Success or Easy Confirmation of Success

A new design that is merely "obvious to try" as a means for solving a practical problem or accomplishing a practical task is not deemed obvious for patent law purposes based on this feature alone.[58] If there remains a significant difficulty in proving the success of a possible design solution that was "obvious to try," a practitioner with common skills probably would either not follow through on the confirmation or not perform the confirmation steps properly. These sorts of barriers to confirming the success of the design would discourage practitioners from trying this design approach, making it unlikely that there would be a routine discovery of an invention based on the design

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52 Prior art considered in obviousness assessments also includes design information available from the public use or sale of other devices or processes before the time of a disputed invention. If a process or a device is used in a non-secret manner, then the design knowledge made available to the public by that use becomes part of the prior art knowledge considered in patent analyses. *See, e.g.,* W.L. Gore & Assoc. v. Garlock, Inc., 721 F.2d 1540, 1548-49 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984).

53 *See infra* text accompanying notes 236-42.

54 *See infra* text accompanying notes 243-55.

55 *See infra* text accompanying notes 256-68.

56 *Ex parte* Kranz, 19 U.S.P.Q.2d (BNA) 1216, 1217-18 (Bd. Pat. App. & Interferences 1990).

57 *Id.*

58 *See, e.g.,* Novo Nordisk A/S v. Becton Dickinson and Co., 304 F.3d 1216, 1219 (Fed. Cir. 2002).

despite its being "obvious to try."[59] For a design approach to be considered obvious and unpatentable, there must be more than just an indication that a design approach was a candidate for solving a practical problem.

The evidence needed to establish the obviousness of an invention includes a confirmation in the prior art existing at the time of the invention that the new design approach used in the invention would have been predictably successful or, if this prediction could not be made without using the invention, that there would be easy and quick steps to confirm success through testing. While these two types of features — predictable success and easy corroboration — both concern the effort needed to confirm the usefulness of a potential design approach and the corresponding likelihood that the design approach would be pursued and brought to public attention by a common practitioner, the two types of features differ in some key details.

A predictably successful design solution is present where a component or characteristic of a new design is generally associated with delivery of the functionality needed to solve a practical problem. Proof of this type of predictable success involves evidence not only of similar functionality associated with the same or similar design components as used in prior devices or processes, but also further evidence indicating at least a practical understanding of the sources of the relevant functionality such that persons in the relevant field would have been confident that use of the particular design approach would reliably result in the desired functionality.[60]

Where the prior art merely suggests that a large number of design alternatives might solve a practical problem and does not indicate which of the many alternatives will work, one of the alternatives may still be a nonobvious and patentable invention.[61] The nonobviousness of a particular invention made in these circumstances will turn on the difficulty of confirming the functional success of the design approach adopted in the invention. As noted by commentators discussing a case in which a large number of design candidates were "obvious to try":

> Simply calculating the total number of possibilities is an absolute measure of the task [of confirming the success of a particular design]. The enormity of the task on a relative scale was routine at the time [the invention in dispute] was made, even though the magnitude sounds

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59 *See* Merck & Co. v. Danbury Pharmacal Inc., 694 F. Supp. 1, 29 (D. Del. 1988), *aff'd*, 873 F.2d 1418 (Fed. Cir. 1989) ("[T]he governing standard is emphatically not whether a particular method or process leading to an invention would be 'obvious to try' . . . but whether such an experiment would have been expected to succeed. . . . Moreover, this expectation must be measured with deliberate avoidance of hindsight assessment. . . . However, the standard does not require 'absolute predictability.'"). *See also In re* Fine, 837 F.2d 1071, 1075 (Fed. Cir. 1988); *In re* Merck & Co. 800 F.2d 1091, 1097 (Fed. Cir. 1986).

60 *Id.*

61 *See In re* Bell, 991 F.2d 781, 784 (Fed. Cir. 1993); Anita Varma & David Abraham, *DNA is Different: Legal Obviousness and the Balance Between Biotech Inventors and the Market*, 9 HARV. J.L. & TECH. 53, 72-75 (1996).

> astounding on an absolute scale. The impact of this knowledge on the obviousness of the invention cannot be ignored.
>
> The suggestion test takes all of this into account by requiring that the prior art suggest the claimed invention without specifying the required precision of the suggestion . . . . The relative comparison is made by the additional requirement that the prior art have provided a reasonable expectation of success for one of ordinary skill. Thus, this two-part test represents a compromise which addresses concerns from both sides of the selection invention question.[62]

For example, where the prior art disclosed an amino acid sequence and one of ordinary skill could potentially have constructed the synthetic gene for biosynthesis of the sequence, the Board of Patent Appeals and Interferences deemed the gene obvious and unpatentable.[63] According to the Board, the key inquiry was whether there would have been a reasonable expectation of success in synthesizing the gene based on knowledge in the prior art. The Board concluded that the total synthesis of the relevant DNA sequence was possible by one of ordinary skill because the amino acid sequence was known and the total synthetic procedures were disclosed in the prior art.[64]

c. Evidence of Multiple Contemporaneous Discoveries

Evidence of engineering development in a field at or soon after the point of a disputed invention can provide direct evidence of generally held engineering capabilities and the related obviousness of the invention.[65] Some courts have found evidence of multiple contemporaneous discoveries of a new design approach by parties other than a patent applicant to indicate that the design approach was within the abilities of average practitioners and therefore obvious and unpatentable.[66] To the extent that these other discoverers were

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62 *Id.* at 79 (discussing the suggestion test for invention obviousness as it applies "selection inventions" — that is, inventions involving the selection of a specific substance, device or process characteristic from a narrow range within a broad range disclosed by the relevant prior art).

63 *Ex parte* Hudson, 18 U.S.P.Q.2d (BNA) 1322**,** 1324 (Bd. Pat. App. & Interferences 1990).

64 *Id. See also* Varma & Abraham, *supra* note 61, at 80.

65 Evidence of engineering skill levels at the time of an invention may be admissible to establish the then-current abilities of average practitioners even though the same evidence would not be admissible in establishing the content of prior art knowledge. *See, e.g.,* Newell Cos. v. Kenney Mfg., 864 F.2d 757, 785-86 (Fed. Cir. 1988), *cert. denied*, 493 U.S. 814 (1989) (finding that internal memo not publicly available and therefore not part of the prior art was admissible to show that persons of ordinary skill were capable of producing designs that were similar to a contested invention at approximately the same time as the date of the invention).

66 See Nordberg, Inc. v. Telsmith, Inc., 881 F. Supp. 1252, 1296 (E.D. Wis. 1995) ("It is well established that contemporaneous and independent development of the claims-in-suit by another inventor strongly suggests that the invention of the patent was obvious.");

fair representatives of practitioners with common skills, their independent discovery and application of the same design approach provides direct evidence that the approach was one capable of discovery through routine expansion of engineering knowledge in the relevant field of design. However, the fact that a party other than an inventor seeking a patent adopted the same design approach in the same time frame as the inventor does not indicate that the invention was obvious if the other party had capabilities or knowledge beyond those of practitioners with commonly held skills.

C. Obviousness Evaluations of Computer Updates

The types of invention obviousness evaluations described in this section force courts and other analysts to examine the normal course of engineering activities in particular fields and to predict how engineering knowledge was likely to expand at the time of particular inventions. The central topics of the remainder of this article are the means for expanding engineering knowledge concerning computer updates and the ways that probable directions of knowledge expansion in this area can be detected and evaluated as part of invention obviousness assessments.

In the next section, I present an overview of some of the distinctive engineering features of computer updates that raise special obviousness issues.[67] I then describe the patent enforcement controversy in *Amazon.com, Inc. v. Barnesandnoble.com, Inc.*[68] and some of the invention obviousness evaluations in that case.[69] The problems addressed in these evaluations are typical of the difficult issues federal courts have encountered in examining the obviousness of computer updates to earlier business methods and devices. I use the judicial evaluations of invention obviousness in this case to analyze some of the deficiencies of recent court inquiries into the obviousness of computer applications.[70] I then propose another approach, based on a reassessment of legal precedents concerning invention obviousness, which simplifies and clarifies the evaluation of obviousness issues in many computer contexts.[71]

This proposed approach recognizes that rational optimization of earlier designs in accordance with widely recognized engineering principles generally produces obvious modifications to the earlier designs. This principle is used to argue that computer updates that follow the information processing steps of prior devices or processes, but which slightly rearrange those steps to

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ROSENBERG, *supra* note 27, § 9.02[2][a][iii].

67 *See infra* text accompanying notes 75-85.

68 239 F.3d 1343 (Fed. Cir. 2001) (vacating the preliminary injunction imposed in Amazon.com, Inc. v. Barnesandnoble.com, Inc., 73 F. Supp. 2d 1228 (W.D. Wash. 1999)).

69 *See infra* text accompanying notes 121-62.

70 *See infra* text accompanying notes 163-71.

71 *See infra* text accompanying notes 270-76.

capitalize on the speed and accuracy of computer processing, are rational optimizations of prior designs that are obvious and unpatentable.[72]

The proposed test for assessing the obviousness of computer updates is then used to reevaluate the obviousness of the invention at issue in *Amazon.com*.[73] I argue that this revised analysis is both simpler and more understandable than the federal courts' analyses in that case. At the same time, the proposed approach conforms roughly to the ways that software programmers might themselves view the likelihood and obviousness of new computer-based designs. Since the obviousness of computer updates must be evaluated by both courts and persons in the computer field who wish to consider the scope and influence of patent rewards and restrictions, an invention obviousness test for computer updates that is simple to apply and familiar to software specialists has many advantages over the ambiguous and complex standards presently applied by many courts.

II. OBVIOUSNESS EVALUATIONS OF COMPUTER UPDATES

Computer updates of earlier devices or processes involve computer programs that implement and improve information processing steps or control features of the original devices or processes.[74] These updates often contain distinctive engineering features that make their obviousness difficult to assess for purposes of determining patent rights. This section will describe some of these computer update features that raise special obviousness issues.

A. Computer Update Features Shaping Obviousness Evaluations

1. Updates Meld Computer and Application Domain Technologies

Computer updates are technological hybrids that often meld two very different types of technologies. On the one hand, such updates are grounded in the technologies of their application domains. These earlier technologies have been developed without reference to computer technology and applied in creating the non-computer predecessor devices or processes being updated. To the extent that some or all of the components of these prior devices or processes are carried forward into computer updates, substantial aspects of these older technologies may dictate key features of the new designs.[75]

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72 *See infra* text accompanying notes 274-77.

73 *See infra* text accompanying notes 278-80.

74 *See, e.g.,* Diamond v. Diehr, 450 U.S. 175 (1981) (evaluating a patented process involving a computer update of a rubber mold); U.S. Patent No. 5,960,411 (issued Sept. 28, 1999) (describing a computer update of purchasing processes in traditional stores); U.S. Patent No. 5,794,207 (issued Aug. 11, 1998) (describing a computer update of auction processes).

75 For example, a computer controlled rubber mold retains many of the physical features of prior rubber molds. Even the new features of computer updates of rubber mold designs may be largely dictated by the technological characteristics of the molds and rubber

However, computer updates also incorporate computer processing steps that interact with and augment the pre-computer features of older designs. In these new designs, computer processing may substitute for information processing features of earlier designs or add new controls or outputs to the old designs.

Because they build upon past designs in both technological domains, computer updates typically have roots in their application fields and in past computer processing techniques. Given their complex roots, the heritage of computer updates — and, hence, their obviousness as new inventions — is often unusually difficult to evaluate.

Even the non-computer technologies that computer updates build upon may reflect several different domains of technology or business expertise. For example, a mechanical cash register design reflects two types of expertise: specialized commercial knowledge about the types of cash transactions and business activities the cash register must support and further expert knowledge about the mechanical and materials engineering principles used to construct the cash register. Hence, the cash register involves diverse, multilayered expertise and technology even before the overlay of computer features is added to produce a computer-updated version.

Computer updates of these sorts of prior designs add computer-controlled features or information processing steps that improve or simplify the operation of the prior devices or processes. The emphasis is on some aspect of enhanced or altered information processing that takes advantage of the exceptional speed and accuracy of computer processing.[76] However, given the diversity of information processing capabilities that can be implemented on computers and the malleability of those capabilities from application to application, the precise combinations of new information processing steps present in a computer update of an older design may be very complex, as may be the relationships of these new steps to information processing elements carried over into the updates from the designs of older devices and processes.

2. Types of Updated Components

Designing a computer update of an old device or process typically entails altering information processing features of the prior device or process or changing operational sequences that can be better performed or controlled by a computer. At least three types of updates result from these sorts of computer augmentation of earlier designs.

a. Improved Information Processing Steps

In some computer updates, pre-existing information processing steps taken from designs of old devices or processes are translated into computer

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materials involved. *See id.* at 187-88 (describing a computer-controlled update of a rubber molding process as simply an improved version of the physical molding process).

76 This type of adjustment of previous information processing steps to capitalize on the strengths of computer-based information processing was at the heart of the online purchasing innovation at issue in *Amazon.com*. *See infra* text accompanying notes 103-10.

processing steps.[77] Some of the previous information processing steps will have direct counterparts in the new designs while other processing steps will be altered to take full advantage of computer processing capabilities or to accomplish new tasks that are only made practical because of these capabilities. For example, in a computer update of a physical cash register design, the cash counting functions formerly undertaken by some combination of physical wheels or other physical components might be replaced by a computer keeping track of data corresponding to cash amounts. In this type of update, the computer-augmented design is aimed at producing the same information processing results as its non-computer predecessor, but with increased speed, accuracy, reliability, product simplification, or reduced product cost attainable by the new computer processing steps.

b. Computer Processing Substituted for Earlier Mechanical Steps

Another somewhat different version of computer updates involves re-conceiving aspects of earlier designs that have previously hidden or ignored information processing functions. In computer updates of this sort, portions of prior devices or processes that were implemented through physical design components in the earlier designs are translated into their essential information processing features and then re-implemented as information processing procedures using computer and information communication technologies.

The evolution of airplane control technologies in recent years provides good examples of this type of computer update.[78] From an earlier era in which airplane control surfaces such as elevators or wing flaps were mechanically linked to pilots via a complex series of wires and levers, airplane designers have substituted electronic sensors to measure control surface positions, data communication lines to transmit control surface state information to cockpit computers that analyze the measurements, computer systems that combine control surface analyses and human inputs about desired flight paths to issue instructions about needed control surface changes, further communication lines to transmit instructions to change control surface placements, and mechanical servos to implement the changes.[79]

This change from physical to computer-mediated flight systems stemmed from the insight that the prior mechanical linkages which governed the

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77 *See* U.S. Patent No. 5,960,411 (issued Sept. 28, 1999) (describing Amazon.com's computer-augmented "one-click" purchasing system in which information processing steps traditionally undertaken in retail stores are resequenced and transferred to computers).

78 Active control or "fly by wire" systems are aircraft control systems in which computers, combined with sensors, communication linkages, and actuators, are used to monitor aircraft conditions, provide information to pilots, and implement pilot commands. The addition of these systems to earlier aircraft designs made possible significant improvements in aircraft handling, safety, and utility. *See* Dryden Flight Research Center, *F-8 Digital Fly-By-Wire Aircraft*, *at* http://www.dfrc.nasa.gov/Newsroom/FactSheets/FS-024-DFRC.html (last accessed Mar. 21, 2003).

79 *Id.*

positions of airplane control surfaces were basically information transmittal devices, sending control surface information to pilots and control surface change demands from pilots to the control surfaces.[80] Once conceived in this way, the older style mechanical intermediaries could be eliminated in favor of newer electronic means. With this change to electronic intermediaries came a corresponding chance to enhance the frequency and quality of aircraft information processing with computer-based analyses and controls. Hence, the cockpit and related control surface systems of a modern airliner or combat aircraft involve a symphony of information processing by computers and electronic communication technology, much of it aimed at mimicking and improving on earlier physical linkages and mechanical processes.[81]

c. Enhanced Controls for Existing Features

Still other computer updates of earlier devices and processes seek to make improvements in the control features of earlier designs by adding such new elements as sensors to measure device operating states, computer analyses of data about device states to produce information about desirable state changes, and further mechanical linkages to translate this information into physical alterations in the device or process being monitored and controlled.[82] In this type of improvement, computers are used to implement desirable feedback loops in which device or process states are monitored and analyzed to fine tune the operation of particular device or process features and thereby achieve more efficient or effective results.

The computer-controlled ignition systems now present in most cars are examples of this type of update.[83] These ignition systems are updates of earlier engine components that triggered sparks in car engine cylinders and ignited fuel in those cylinders through movements of physical engine parts. More recent computer-based ignition systems monitor aspects of engine movement and trigger the ignition of fuel in particular engine cylinders with sufficiently precise timing to produce greater power and fuel efficiency than prior designs.[84]

This is an example of using computer processing to control and enhance the inner workings of a subcomponent of a larger device. The aim of this type of computer-based update is to achieve the same type of operating results as the

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80 *Id.*

81 *Id.*

82 *See, e.g.,* Diamond v. Diehr, 450 U.S. 175, 177 (1981) (evaluating an invention involving computer-enhanced monitoring and evaluation of a rubber molding process to determine the optimal time to open a rubber mold).

83 American International College of Mexico, *An Architectural History of the Computer*, *at* http://www.fortunecity.com/lavendar/pulpfiction/16/hist4.html (last accessed Mar. 21, 2003) (describing the development in the 1980s of computer-based systems performing process-control, testing, monitoring, and diagnostic functions as in automobile ignition systems).

84 *Id.*

prior versions of the same subcomponent, thereby making the update a direct substitute for its predecessors. At the same time, the new version may achieve significant performance improvements (or be simpler or less costly to produce or operate) due to its enhanced operating controls.

3. Features Suggesting that Updates are Obvious, Unpatentable Variations of Earlier Designs

Each of the above types of computer updates mirrors in some way the information processing features of the prior designs and applications from which the updates were derived. In part, this stems from the fact that these updates are intended to have many design similarities to earlier product or process designs. Major features of the new designs are dictated by aspects of the older designs that, for a variety of reasons, are sought not to be changed. Reasons for replicating older design elements in new computer-based updates include consumer familiarity with the older design features, perceived performance superiority of those older features to computer-based substitutes, and the need for updates to mimic certain operating characteristics of older devices so that the updates can operate as substituted subcomponents in larger devices that are not being redesigned.

Because they carry forward components or design limitations of prior designs, computer updates of those designs often incorporate information processing sequences that are partially dictated by the earlier designs. Indeed, many information processing steps undertaken by computer updates may simply track, step-by-step, the information processing features of prior designs. Computer resources and capabilities used to supplement prior designs may only add speed and accuracy to well understood operating features or steps. Because the speed and accuracy of properly programmed computers have long been recognized, where these commonly appreciated capabilities of computers are all that are added to prior designs, the resulting computer updates have struck some observers as being obvious extensions of the updates' mechanical predecessors.[85]

It remains unclear whether this assessment is a correct evaluation of computer update obviousness for patent law purposes. This article argues that revising older device and process designs to capitalize on the speed or accuracy of computer-based information processing generally involves routine design insights leading to obvious, unpatentable computer updates of the older designs. The article goes on to propose several generally applicable criteria for assessing the obviousness of these sorts of computer updates of older device and process designs.[86]

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85 *See, e.g.,* Tim O'Reilly, *My Conversation With Jeff Bezos*, *at* http://www.oreilly.com /ask_tim/bezos_0300.html (Mar. 2, 2000) (describing a leading computer industry commentator's assessment of the obviousness of the one-click online purchasing innovation at issue in *Amazon.com*).

86 *See infra* text accompanying notes 270-77.

III. AN ILLUSTRATIVE COMPUTER UPDATE: AMAZON.COM'S ONE-CLICK ONLINE PURCHASING METHOD

Recent patent enforcement litigation involving a streamlined purchasing method for online transactions illustrates many of the problems that courts face in assessing the obviousness of computer updates of common business practices. *Amazon.com, Inc. v. Barnesandnoble.com, Inc.*[87] involved two e-commerce giants in a dispute over a popular and commercially valuable online purchasing system. The factual setting and the contrasting analyses of the district and circuit courts in this case reflect the complexity, uncertainty, and potential business disruption commonly associated with invention obviousness determinations for computer updates.

A. The Invention in Dispute

The dispute between Amazon.com and Barnesandnoble.com involved a system for "one-click" online purchasing of items over the Internet or other distributed computer networks. The system, which was developed by Amazon.com founder Jeff Bezos and several associates, was the subject of United States Patent No. 5,960,411 ("the '411 patent"), issued on September 28, 1999.[88] The invention covered by this patent[89] involved a new system of

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87 *See generally* Amazon.com, Inc. v. Barnesandnoble.com, Inc., 239 F.3d 1343 (Fed. Cir. 2001); Amazon.com, Inc. v. Barnesandnoble.com, Inc., 73 F. Supp. 2d 1228 (W.D. Wash. 1999).

88 *See generally* U.S. Patent No. 5,960,411 (issued Sept. 28, 1999).

89 The scope of the invention potentially protected by Amazon.com's patent was described in the patent's claims. *See, e.g.,* Builders Concrete, Inc. v. Bremerton Concrete Prods. Co., 757 F.2d 255, 257 (Fed. Cir. 1985). Claim 1 of the '411 patent was the most inclusive, describing the following invention for which patent rights were asserted:

> A method of placing an order for an item comprising:
> under control of a client system,
> displaying information identifying the item; and
> in response to only a single action being performed,
> sending a request to order the item along with an identifier of a purchaser of the item to a server system;
> under control of a single-action ordering component of the server system,
> receiving the request;
> retrieving additional information previously stored for the purchaser identified by the identifier in the received request; and
> generating an order to purchase the requested item for the purchaser identified by the identifier in the received request using the retrieved additional information; and
> fulfilling the generated order to complete purchase of the item whereby the item is ordered without using a shopping cart ordering model.

"one-click" online purchasing. The Court of Appeals for the Federal Circuit summarized the patented system as follows:

> The '411 patent describes a method and system in which a consumer can complete a purchase order for an item via an electronic network using only a "single action," such as the click of a computer mouse button on the client computer system. Amazon developed the patent to cope with what it considered to be frustrations presented by what is known as the "shopping cart model" purchase system for electronic commerce purchasing events. In previous incarnations of the shopping cart model, a purchaser using a client computer system (such as a personal computer executing a web browser program) could select an item from an electronic catalog, typically by clicking on an "Add to Shopping Cart" icon, thereby placing the item in the "virtual" shopping cart. Other items from the catalog could be added to the shopping cart in the same manner. When the shopper completed the selecting process, the electronic commercial event would move to the check-out counter, so to speak. Then, information regarding the purchaser's identity, billing and shipping addresses, and credit payment method would be inserted into the transactional information base by the soon-to-be purchaser. Finally, the purchaser would "click" on a button displayed on the screen or somehow issue a command to execute the completed order, and the server computer system would verify and store the information concerning the transaction.
>
> As is evident from the foregoing, an electronic commerce purchaser using the shopping cart model is required to perform several actions before achieving the ultimate goal of the placed order. The '411 patent sought to reduce the number of actions required from a consumer to effect a placed order. In the words of the written description of the '411 patent:
>
> > The present invention provides a method and system for single-action ordering of items in a client/server environment. The single-action ordering system of the present invention reduces the number of purchaser interactions needed to place an order and reduces the amount of sensitive information that is transmitted between a client system and a server system.
>
> How, one may ask, is the number of purchaser interactions reduced? The answer is that the number of purchaser interactions is reduced because the purchaser has previously visited the seller's web site and has previously entered into the database of the seller all of the required billing and shipping information that is needed to effect a sales transaction. Thereafter, when the purchaser visits the seller's web site and wishes to purchase a product from that site, the patent specifies that only a single action is necessary to place the order for the item. In the words of the

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U.S. Patent No. 5,960,411(issued Sept. 28, 1999).

> written description, "once the description of an item is displayed, the purchaser need only take a single action to place the order to purchase that item."[90]

The one-click purchasing methodology covered by this patent was implemented by Amazon.com in 1997 and quickly copied by a number of other online vendors.[91] It was haled by several industry figures as a commercially significant advance in online marketing due to its speed advantages to consumers and its ability to decrease the likelihood that online purchasers would suffer buyer's uncertainty and back out of partially completed transactions before paying for tentatively selected items.[92] Online marketers had recognized uncompleted transactions as a significant problem for some time. The Amazon.com purchasing methodology, by accelerating the point of buyer commitment to a sale, reduced the possibility of timely buyer's uncertainty, leading to a greater percentage of completed sales per item accessed and selected by consumers.[93]

Among the sellers adopting a one-click purchasing methodology was Barnesandnoble.com, an online retailer that competed directly with Amazon.com for sales of books and related materials.[94] Under Barnesandnoble.com's short-cut ordering system, called "Express Lane," a customer could select a product, access a product page containing an image and description of the selected product and then, by clicking a mouse on a particular screen icon, complete a purchase of that item.

In 1999, Amazon.com filed a complaint alleging infringement of the '411 patent by Barnesandnoble.com and seeking a preliminary injunction barring the latter's continued use of the Express Lane system.[95] After a five day hearing, the district court in this case issued the requested injunction, concluding that (1) there was no substantial evidence that the '411 patent was invalid for lack of a novel invention; (2) Barnesandnoble.com was unlikely to rebut the presumption of invention nonobviousness flowing from the issuance of Amazon.com's patent and was therefore unlikely to establish patent invalidity on this ground; (3) Amazon.com showed a likelihood of success on the merits of its infringement claim; (4) Amazon.com was entitled to a presumption of irreparable harm in connection with its request for a preliminary injunction and the company actually suffered irreparable injury; (5) the balance of hardships weighed in favor of Amazon.com, further

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90 *Amazon.com, Inc.*, 239 F.3d at 1347-48 (quoting U.S. Patent No. 5,960,411).

91 *See Amazon.com, Inc.*, 73 F. Supp. 2d at 1237.

92 *See id*. at 1236 (Expert testimony characterized Amazon.com's one-click purchasing system as "a major innovation in online retailing that allows for purchasing without disrupting the consumer's shopping experience" and that "maximizes the likelihood that consumers will complete their purchases and minimizes consumer anxiety over real or perceived issues of internet security.").

93 *See id*. at 1237.

94 *Id*. at 1232.

95 *See id* at 1231-32.

supporting the issuance of a preliminary injunction; and (6) the public interest would be served by such an injunction.[96]

The preliminary injunction resulting from this hearing restricted Barnesandnoble.com's online sales practices through the commercially significant sales period of the 1999 Christmas season, as well as for over a year thereafter. Eventually, following an appeal to the Court of Appeals for the Federal Circuit, Barnesandnoble.com gained relief from the injunction.[97]

The court of appeals agreed with the district court that Amazon.com had established a likelihood of success in its claim of infringement of the '411 patent by Barnesandnoble.com, assuming that the patent was valid.[98] However, based on its own reevaluation of the evidence bearing on the obviousness of the patented invention, the court of appeals concluded that the lower court's assessment of the validity of Amazon.com's patent was flawed. The court of appeals found that there was a substantial likelihood that the patent would be shown to be invalid at trial based on the obviousness of the claimed invention and that, consequently, a preliminary injunction should not have been issued.[99] The appellate court then vacated the lower court's injunction and sent the case back for a full trial.[100] However, before the trial began, the case settled without any further published court opinions.[101] The terms of the settlement were not revealed by the parties.[102]

B. The Conceptual Heritage of Amazon.com's Purchasing System: Placing One-Click Purchasing in a Historical Linage of Shopping Systems

In order to understand the invention at stake in the Amazon.com litigation, it is helpful to identify the key information processing features of the claimed shopping system and the differences between those features and earlier online and pre-computer shopping practices. The original features of Amazon.com's purchasing system that distinguished the system from the prior art related primarily to the system's new shopping action sequence and corresponding computer-implementation features. In essence, the invention covered by the '411 patent was a shopping system that involved a modification to earlier online "shopping cart" purchasing systems which were, in turn, descendants of even earlier pre-computer shopping methods in traditional stores.

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96 *Id.* at 1239-49.

97 Amazon.com, Inc. v. Barnesandnoble.com, Inc., 239 F.3d 1343, 1359-66 (Fed. Cir. 2001).

98 *See id*. at 1359.

99 *See id.* at 1359-66.

100 *Id.* at 1366.

101 *See* Troy Wolverton, *Amazon, Barnes&Noble Settle Patent Suit*, CNET NEWS.COM, *available at* http:/news.zdnet.co.uk/story/0,,t269-s2106142,00.html (Mar. 7, 2002).

102 *Id*.

1. The Basic Shopping Process

To begin the analysis at the point of these earlier store systems, it helps to concentrate on the essential information processing steps inherent in a standard trip to the supermarket or other physical store.[103] In going down the aisles to purchase several items, a supermarket customer typically completes the following steps: 1) selecting the item after direct scrutiny ("Select"); 2) tentatively allocating the item for purchasing by placing it in a shopping cart ("Allocate"); 3) accounting for the purchase price of the item by having it rung up at a register ("Account"), 4) paying for the item by tendering cash or making equivalent check or credit card payment arrangements ("Pay"), and 5) taking the item physically out of the store and transporting it to the buyer's home or other place of use or storage ("Take"). Often, in a typical store visit, combinations of steps 1) and 2) are undertaken repeatedly in the early stages of shopping as multiple items are placed in a shopping cart, while the remaining steps are undertaken only once at the end of a shopping trip for the full set of groceries or other items purchased.

2. The Online Shopping Update

As a first generation computer update to this earlier type of physical shopping experience, online vendors conceived and implemented online shopping systems based on a "shopping cart" metaphor.[104] Persons seeking to purchase items at a web site were presented with a shopping experience that closely mimicked (at least in shopping sequence) what they would encounter in a physical store. Products were described in display pages (often grouped by product type) that resembled store aisles or departments. Items selected by customers were recorded, accumulated, and displayed in "shopping cart" records. Once parties made all of their selections on a particular visit to a shopping web site, they were invited to proceed to the "check out" area of the site where a final accounting of the charges due for purchase of the selected items was given and credit card information and delivery instructions were taken. Following completion of these steps and the confirmation of receipt of payment by the vendor, the products were shipped to the purchasers.

These sorts of shopping cart systems, in addition to being easy to conceive and implement based on the model of earlier physical shopping systems, had key advantages to both customers and vendors.[105] For customers, shopping

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103 *See* Eric G. Myers, *The Shopping Cart Experience*, EGM, *at* http://www.egmstrategy.com/carts.html (describing the origins and limitations of online shopping systems based on a shopping cart metaphor) (Feb. 2, 2002); *see* Sarah Bidigare, *Information Architecture of the Shopping Cart*, ACIA (May 2002), *available at* http://argus-acia.com/white_papers/shopping_cart_ia.pdf (describing design features of ecommerce systems based on a shopping cart metaphor).

104 *See generally* Chris Baron & Bob Weil, *Implementing a Web Shopping Cart*, DR. DOBB'S J., Sept. 1996, at 64, 66-69, 83-85.

105 *See* U.S. Patent No. 5,960,411 (issued Sept. 28, 1999) (describing online purchasing

cart systems were easy to understand and navigate, capitalizing on the pre-existing expectations of buyers from their earlier store experiences about what should come next at each stage of the online purchasing process and making the somewhat new online purchasing environment less confusing and threatening as a result. For vendors, shopping cart systems implemented a proven retail accounting and inventory management metaphor which ensured that basic information needed to conclude a sales transaction reliably and to manage related activities such as product deliveries and inventories was collected in a sound way. Vendors, like customers, could use what they already knew about older sales systems to ensure that online sales proceeded smoothly.

3. The Advent of New Computer-Based Shopping Methods

Despite their advantages, there were some flaws and unrealized potential in these early online purchasing systems. By simply trying to replicate a physical store experience in online displays, online "shopping cart" purchasing arrangements failed to consider the full range of possible shopping variations that might be implemented based on the special information processing capabilities of computers and computer networks. As these capabilities were increasingly understood, various developers produced (and, in several instances, patented) new methods of offering items to customers though computer-based information processing.

These new marketing systems included enhanced auction systems such as those supported over eBay and other auction sites[106] and reverse auction systems such as that offered by Priceline.com and others where customers establish prices they are willing to pay for goods and services and suppliers determine whether to accept those prices and conclude a binding contract.[107] Other more elaborate systems aimed at consumer preference monitoring, preference analyses, and product recommendations were further examples of new forms of online marketing and shopping systems that extended traditional shopping experiences and systems in new ways made possible by computer technologies.[108]

4. The "One-Click" Modification to Online Shopping

The particular shopping experience extension present in the invention at issue in *Amazon.com* was a simple one. Reevaluating the five step purchasing sequence described above (Select, Allocate, Account, Pay, Take),

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systems based on a shopping cart model as "very flexible and intuitive").

106 *See, e.g.*, eBay Tutorials, *Getting Started*, EBAY.COM, *at* http://www.ebay.com/education/tutorial/course1/index.html (last accessed Mar. 21, 2003) (describing features of online auctions conducted through eBay).

107 *See generally* U.S. Patent No. 5,794,207 (issued Aug. 11, 1998) (describing a method and apparatus facilitating "buyer driven conditional purchase offers").

108 *See* U.S. Patent No. 5,948,061 (issued Sept. 7, 1999) (describing a method of profiling Internet user preferences and targeting advertising based on these preferences).

Amazon.com chief executive Jeff Bezos and his co-inventors recognized that certain steps could be rearranged and repeated in online shopping in ways that would not be desirable in traditional physical stores.[109] Instead of a system such as a physical supermarket shopping process or an online "shopping cart" system in which the Select and Allocate steps are performed repeatedly until all the items a consumer desires are identified and then the last three steps of Account, Pay, and Take are performed once for the group of items, the speed of computer processing would allow all five steps to be completed instantly when an item was identified for purchasing.[110] Credit card and shipping information for a given customer could be gathered once for each customer and retained on file such that, when an item was selected by a customer for purchasing, the payment and shipping information for that customer could be associated with the item and the item could be sent on its way to the buyer.[111]

In essence, the developers of this "one-click" method of shopping envisioned a physically unbound online environment where purchasing steps that would be awkward in a physical setting became advantageous due to the compression of time needed to complete the steps. In a physical setting, to complete the type of purchasing sequence implemented in Amazon.com's one-click purchasing system, a person would need to go into a supermarket and select a carton of milk, proceed to the cash register, pay for the milk, and take it home, and then go back for a loaf of bread, take the same further steps, and then go back again for some celery. In a world where the time delays of physical passage through an online store are nonexistent and the time needed for electronic record keeping on purchase features such as payment and shipping arrangements are negligible, this sequence of item by item completion of the purchasing process is functionally attractive even though it clearly would not be so in a traditional physical store.

5. Conceptual Cousins of "One-Click" Shopping

There remains some question about how original Amazon.com's "one-click" shopping method was, however.[112] Several types of long standing purchasing systems with very similar purchasing sequences preceded the development of Amazon.com's system and may have rendered that system a mere obvious variation of prior purchasing practices.

One commentator has likened Amazon.com's purchasing system to the system present in many bars where a regular customer is allowed to keep a tab

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109 *See* O'Reilly, *supra* note 85 (describing the conceptual background of the Amazon.com one-click purchasing system).

110 *Id.*

111 *See* U.S. Patent No. 5,960,411 (issued Sept. 28, 1999).

112 *See 1-Click Prior Art*, *available at* http://www.bountyquest.com/patentinfo/oneclickart.htm#no22thru24_29 (last accessed Feb. 2, 2003) (describing prior purchasing system designs related to Amazon.com's patent submitted in response to a $10,000 reward offered for prior art exactly matching the patented invention; submitted sources included a Doonesbury cartoon depicting "Just Point Shopping").

and make payments of the outstanding balance either at the end of an evening or at some other convenient time.[113] In order to select an item and make associated arrangements to pay for it, a customer need only say something like, "Hey Joe [the bartender], put another Heineken on my tab." Joe will then serve up the beer, add the cost of the beer to the customer's account, and conclude the purchase transaction.

This item by item purchasing arrangement has many of the same steps as the purchasing system at issue in *Amazon.com*. Advanced arrangements for payment (and traditional means of delivery) are associated with individual purchased items upon a specific symbolic gesture (one mouse click in the online context and an order referring to the "tab" in the bar context). The purchasing process is typically repeated item by item rather than having a customer gather a group of tentatively selected items with payment and delivery arranged for the group of items at the end of the shopping experience.[114]

Another familiar shopping experience that replicates many features of the claimed invention in *Amazon.com* is present every time a customer buys an item at a drink or snack vending machine.[115] A vending machine customer looks at choices, makes a selection, enters coins or bills for payment, and receives delivery. If another item is desired, the process is repeated item by item. While this arrangement does not entail prearranged specification of payment and shipping details, these advanced arrangements are simply not needed in connection with vending machine purchases as the transactions are conducted for cash and delivery is immediate. This familiar vending machine context does, however, illustrate that item by item shopping and purchase completion are commonplace in some purchasing settings.

The important point of similarity between the purchasing process at vending machines and the type of purchasing system at issue in *Amazon.com* is that, in both contexts, distance between the site of shopping and the point of purchase is removed as a source of transit delays, thereby making item by item conclusion of a purchasing transaction conveniently quick. In the "one-click" methodology, the compression or elimination of distance as a factor is handled electronically. In the vending machine context, the effects of distance are eliminated by bringing the point of product display and delivery into physical

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113 *See* Dreyfuss, *supra* note 17, at 279 n.55 (noting that Amazon.com's "patent on one-click basically covers the concept (particularly well known in bars) of asking the seller to put a particular purchase 'on my tab.'").

114 The one remaining difference between the Amazon.com one-click system and bar tab purchasing sequences lies in how payment is made. In the Amazon.com system, payment is prearranged and happens automatically when an item is selected. In the bar tab system, there is an advanced commitment to make future payment for items selected, but actual payment will usually require a further act of periodically settling a tab account.

115 I am indebted to my colleague David Welkowitz for recognizing the similarities between vending machine purchasing sequences and the shopping system at issue in Amazon.com.

proximity with the point of payment. Because many of the effects of physical distance are eliminated in both contexts, the long standing practice of vending machine purchasing is a close counterpart to the purchasing steps of the invention at stake in *Amazon.com*.

As these conceptual analyses suggest, the purchasing system at issue in *Amazon.com* had several non-computer predecessors with similar purchasing steps. Given the model of purchasing steps provided by these earlier, non-computer counterparts, fairly straightforward and well understood programming methods may have been sufficient to implement these earlier purchasing metaphors in related software programming. This would have rendered the computer updates present in *Amazon.com* obvious and unpatentable.[116] However, neither the district nor appellate courts in this case assessed the obviousness of Amazon.com's invention in terms of these pre-computer counterparts. Rather, the courts evaluated the obviousness of the claimed invention solely in terms of prior art describing earlier designs and systems for computer-implemented online purchasing. The two courts reached substantially different conclusions about the scope and implications of that online purchasing prior art, with their respective evaluations emphasizing narrow features and interpretations of the prior art that might have been overlooked by average practitioners in the field.[117] However, both courts seem to have ignored the fundamental point that Amazon.com's purchasing system may have been obvious and unpatentable not so much because it was an obvious offshoot of prior online purchasing systems, but rather because it was an obvious variation of purchasing steps long present in stores, bars, vending machines, and other non-computer based purchasing environments.

At best, the significantly different interpretations of the district and appellate courts in this case indicate how legal evaluations of the obviousness of computer updates can vary widely and how uncertain and potentially misleading predictions about these evaluations can mislead patent holders and potential infringers. At worst, the narrowly focused and divergent assessments of these courts may reflect hidden and varying criteria for evaluating invention obviousness, criteria which may depart materially from the Supreme Court's direction that determinations of invention obviousness should turn on the meaning and implications that designers with common skills would draw from prior art when conducting routine design analyses in the same or analogous design fields.[118]

The poorly expressed obviousness criteria relied on by the courts in *Amazon.com* provide little or no guidance for courts and legal analysts seeking to conduct future assessments of patent rights surrounding computer updates of earlier technologies. The developers of such updates, as well as parties who wish to avoid unknowingly infringing the patent rights of those developers,

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116 *See, e.g.,* Dreyfuss, *supra* note 17, at 279.

117 *See infra* text accompanying notes 121-71.

118 *See infra* text accompanying notes 176-77.

need better answers and clearer standards regarding the necessary features of patentable computer updates.

The remainder of this section briefly describes the invention obviousness evaluations conducted by the courts in *Amazon.com*. At a later point, a simplified approach to assessing the obviousness of a computer update like that in *Amazon.com* is proposed and then used to reevaluate the obviousness of Amazon.com's purchasing system.[119] A subsequent portion of this article argues that the proposed approach produces analyses that are more straightforward than the evaluations conducted by the courts in *Amazon.com* and more attuned to the ways that computer programmers would analyze and develop computer updates to prior physical devices and processes.[120]

C. Divergent Judicial Views of the Obviousness of Amazon.com's Invention

1. Challenges to Patent Validity in Preliminary Injunction Hearings

A patent issued following an examination and evaluation by the United States Patent Office is cloaked with a presumption of validity, including a presumption that the invention involved is nonobvious.[121] To demonstrate patent invalidity at trial, a defendant in a patent infringement case must present clear and convincing evidence of invalidity to overcome the presumption.[122]

However, in a preliminary injunction hearing, a defendant seeking to avoid such an injunction need not make out a case of actual patent invalidity, but rather need only present evidence raising a substantial question of invalidity. As noted by the Court of Appeals for the Federal Circuit, patent "[v]ulnerability is the issue at the preliminary injunction stage, while validity is the issue at trial."[123] This standard is premised on the view that, in a competitive environment such as the online marketplace in *Amazon.com*, a patent which is shown to be vulnerable to an invalidity claim is not a proper basis for the business disruptions and competitive restrictions associated with the enforcement of a preliminary injunction even though the patent may later hold up under complete scrutiny and be held valid and enforceable at trial.[124] Hence, in order to resist the preliminary injunction sought by Amazon.com on

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119 *See infra* text accompanying notes 271-80.

120 *See infra* text accompanying note 281.

121 *See* Perkin-Elmer Corp. v. Computervision Corp., 732 F.2d 888, 894 (Fed. Cir. 1984) ("Included within the presumption of validity mandated by 35 U.S.C. § 282 is a presumption of nonobviousness which the patent challenger must overcome by proving facts with clear and convincing evidence. The presumption remains intact even upon proof of prior art not cited by the Patent and Trademark Office (PTO), though such art, if more relevant than that cited, may enable the challenger to sustain its burden." (citations omitted)).

122 *See, e.g.,* Schumer v. Lab. Computer Sys., Inc., 308 F.3d 1304, 1315 (Fed. Cir. 2002).

123 *Amazon.com, Inc.*, 239 F.3d at 1359.

124 *Id.*

invention obviousness grounds, Barnesandnoble.com was required to present evidence raising a substantial question about the obviousness of the invention claimed in the '411 patent and to thereby raise doubts about the enforceability of that patent.[125]

2. The District Court's Review

In the estimation of the district court in *Amazon.com*, the sole evidence presented at the preliminary injunction hearing regarding the obviousness of the invention at issue was testimony by a particular inventor that he could modify a prior art system which he had developed to be a single-action ordering system like the patented invention, and that doing so would be an "obvious" or "trivial" modification.[126] However, the same inventor testified that it had never occurred to him to make this modification. Furthermore, the plaintiff presented testimony from one of its experts indicating why a person skilled in the art would not, at the time the invention was made, have considered a single-action modification to the first expert's system.[127] The district court appears to have found the inventor's overall testimony unconvincing regarding the key issue of whether an average practitioner would have been likely to have pursued development of purchasing systems like the patented design.

The district court also considered several secondary factors providing circumstantial evidence of the nonobviousness of the patented invention.[128] In particular, the court noted the adoption of single-action ordering by e-commerce retailers other than Amazon.com following the latter's introduction of the feature.[129] This commercial success was coupled with a long standing need to solve the problem of abandoned shopping carts by e-commerce customers and the failure of other approaches to solve this problem as well as the Amazon.com one-click purchasing system. The commercial success of the Amazon.com system probably suggested to the district court that Amazon.com's approach was a nonobvious solution to the practical task of avoiding abandoned online shopping attempts. As a long standing problem of commercial importance, other parties had probably tried to solve this problem but had apparently failed to produce good solutions as evidenced by the lack of competing processes for accomplishing the same task as effectively as the Amazon.com system.[130]

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125 *Id.* at 1358-59.

126 *See Amazon.com, Inc.*, 73 F. Supp. 2d at 1241.

127 *Id.*

128 *Id.* at 1242.

129 *Id.* *See also* Graham v. John Deere Co., 383 U.S. 1, 17-18 (noting that "[s]uch secondary considerations as commercial success, long felt but unsolved needs, [and] failure of others" are relevant evidence of obviousness); Arkie Lures, Inc. v. Gene Larew Tackle, Inc., 119 F.3d 953, 957 (Fed. Cir. 1997) (noting that considerations of commercial success, licensing activities, and copying may be "highly probative of the issue of nonobviousness").

130 *See Amazon.com, Inc.*, 73 F. Supp. 2d at 1241.

Based on the district court's assessment of this prior art evidence and of secondary factors providing circumstantial evidence of the nonobviousness of Amazon.com's system, the court found that Barnesandnoble.com was unlikely to succeed in showing by clear and convincing evidence that the '411 patent was invalid due to the obviousness of the patented invention. Hence, the court treated the '411 patent as valid and issued the preliminary injunction sought by Amazon.com.[131]

3. The Court of Appeals' Reassessment

On appeal, the Court of Appeals for the Federal Circuit evaluated the same record of prior art and testimony as the district court, but saw very different invention obviousness implications. The court of appeals found that at least five prior art sources in the record suggested the obviousness of the invention at issue in *Amazon.com*.[132] The prior art identified as important by the court of appeals included the following:

1. Barnesandnoble.com argued that a purchasing system called the "CompuServe Trend System" rendered Amazon.com's patent invalid because the patented invention was either not novel (since the earlier and patented systems were the same) or obvious (since any differences between the earlier and patented systems would have been seen as obvious variations by designers of online purchasing systems with common skills).[133] The "Trend" service allowed CompuServe subscribers to obtain stock charts for a surcharge of 50 cents per chart.[134] As part of this service, CompuServe used a "single action ordering technology" like that covered by the '411 patent.[135]

Amazon.com argued that the Compuserve system involved several purchasing steps that were not part of the Amazon.com system.[136] The court of appeals felt that these differences were narrow or nonexistent, suggesting that the Compuserve system might render the '411 patent invalid due to either a lack any new invention in the patented system or a lack of nonobvious differences between the patented invention and the Compuserve system.[137] The court seems to have concluded that evidence regarding the Compuserve system supported a finding of invention obviousness due to what the court saw as a close similarity between the Compuserve and Amazon.com purchasing systems.[138]

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131 *See id*. at 1242.
132 *See Amazon.com, Inc*, 239 F.3d at 1359-66.
133 *Id*. at 1360.
134 *Id.*
135 *Id.*
136 *Id.* at 1361.
137 *Id.* at 1363.
138 *Id*. at 1360-63.

2. In addition to the CompuServe Trend System, Barnesandnoble.com presented evidence of a prior art system developed by a Dr. Lockwood. Lockwood testified that he developed and disclosed an online ordering system called "Web Basket" prior to the development of the Amazon.com system.[139] The Web Basket system was an embodiment of a shopping cart ordering system that required users to accumulate items in a virtual shopping basket and to check these items out when they were finished shopping.[140] Because it was based on a shopping cart model, Web Basket required several confirmation steps for users to complete their purchases.[141] Hence, it differed somewhat from the one-click process involved in Amazon.com's invention.

However, the Web Basket system shared one key characteristic with the patented invention. The Web Basket system incorporated a means whereby customer information (such as credit card information and shipping details) was collected once and then associated with particular purchase transactions as these were completed.[142] The court of appeals felt that the district court ignored this similarity and the degree to which it rendered at least some aspects of Amazon.com's invention previously known or obvious.[143]

3. Barnesandnoble.com also presented evidence of a prior art reference comprised of a book that was copyrighted prior to the development of Amazon.com's invention.[144] The book discussed software that implemented a shopping cart ordering model. In passing, the book referred to the possibility that merchants might use software to implement an instant purchasing option. The text passage referring to this option was as follows:

> Instant Buy Option
>
> Merchants also can provide shoppers with an Instant Buy button for some or all items, enabling them to skip check out review. This provides added appeal for customers who already know the single item they want to purchase during their shopping excursion.[145]

The district court concluded that this passage did not refer to a one step purchasing process, but rather just a process in which the checkout review step was skipped, leaving several steps still needed to conclude a

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139 *Id.* at 1363.
140 *Id.*
141 *Id.*
142 *Id.*
143 *Id.* at 1363-64.
144 *Id.* at 1364.
145 *Id.* at 1364.

purchasing transaction.[146] The court of appeals felt that the district court failed to recognize that "a reasonable jury could find that this passage provides a motivation to modify shopping cart ordering software to skip unnecessary steps."[147] This evidence of motivation, in turn, provides some indication that the average practitioner with common skills would try this design approach, meaning that the approach was obvious.[148]

4. The court of appeals also focused on another prior art reference in the form of a web page describing an ordering system called "Oliver's Market."[149] The system involved a multi-step shopping cart model for completing purchases, making the system somewhat different from Amazon.com's one-click system.[150] However, the web page included the following sentence: "A single click on its picture is all it takes to order an item."[151]

According to the court of appeals, this quoted language emphasized how easy it is to order items online.[152] The court of appeals felt that the district court failed to recognize that a reasonable jury could find that this sentence provided a motivation to modify a shopping cart model to implement "single-click" ordering as claimed in the '411 patent.[153]

In addition, the court of appeals asserted that the district court failed to recognize that other passages from this web page could be construed by a reasonable jury as evidence of the lack of novelty or obviousness of the invention covered by the '411 patent.[154] For example, the web page stated that "[o]ur solution allows one-click ordering anywhere you see a product picture or a price."[155] The reference also described a system in which a user's identifying information (*e.g.*, username and password) and purchasing information (*e.g.*, name, phone number, payment method, delivery address) were captured and stored in a database "the very first time a user clicks on an item to order."[156] Asserting that this web page content had the potential to encourage an average practitioner to take a design approach similar to that used in Amazon.com's invention, the court of appeals concluded that this reference raised a substantial question

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146 *Id.*
147 *Id.*
148 *Id.* at 1365.
149 *Id.*
150 *Id.*
151 *Id.* at 1365.
152 *Id.*
153 *Id.*
154 *Id.*
155 *Id.*
156 *Id.*

of invention obviousness and patent invalidity, either alone or in combination with the other references cited by Barnesandnoble.com.[157]

5. The final prior art reference considered by the court of appeals was United States Patent No. 5,708,780 ("the '780 patent"), which described "Internet server access control and monitoring systems."[158] In the preferred embodiment of the invention described in the '780 patent, a user browsed the world wide web conventionally, and a content server provided web documents to the user and determined when the user was seeking access to "controlled" content, *i.e.*, web pages for which the user needed authorization to browse.[159] The '780 patent went on to describe a process of "forwarding a service request from the client to the server and appending a session identification (SID) to the request and to subsequent service requests from the client to the server within a session of requests."[160]

The court of appeals felt that the district court failed to recognize that a reasonable jury could find that the delivery of items in the manner covered by the '780 patent might constitute a "single action ordering component," making the system covered by the '780 patent a close counterpart to the purchasing system addressed by Amazon.com's patent.[161] The court apparently felt that the nearness of the information processing steps of this system to those steps covered by Amazon.com's '411 patent constituted evidence that Amazon.com's invention was obvious and unpatentable.[162]

4. The Differing Court Assessments — An Appraisal

The differing judicial analyses of the prior art at issue in *Amazon.com* seem to depend on divergent views of the conceptual and information processing similarity of several prior art purchasing systems to the system address by the '411 patent.

To the district court, most of the prior art sources cited by Barnesandnoble.com entailed purchasing systems or other information processing schemes that included significantly different information processing steps from those covered by the '411 patent.[163] The large differences perceived by the district court made these prior art sources largely irrelevant to the determination of the obviousness of the invention covered by the '411

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157 *Id.* at 1365-66.
158 *Id.* at 1365.
159 U.S. Patent No. 5,708,780 (issued Jan. 13, 1998).
160 *Id.*
161 *Amazon.com, Inc.*, 239 F.3d at 1365.
162 *Id.* at 1365-66.
163 *Id.* at 1350, 1352, 1358.

patent.[164] The court apparently saw nothing in the prior art that would have suggested the desirability of these differences to an average practitioner of online purchasing system design or that would have otherwise motivated such a practitioner to pursue a design with such differences from the prior art designs.

By contrast, the court of appeals found close similarity between the invention addressed in the '411 patent and the purchasing and information handling systems addressed in five separate prior art systems or references.[165] Based on this perceived similarity, the court seems to have equated processing similarity with invention obviousness, concluding that each of the five prior art systems or references provided some evidence of the obviousness of the invention covered by the '411 patent.[166] Finally, the court was apparently impressed by the cumulative weight of the prior art evidence, suggesting that, even if each bit of prior art evidence standing alone was not sufficient to raise a substantial question about the obviousness of Amazon.com's invention, the aggregate of this evidence was sufficient to raise doubts about the nonobviousness of Amazon.com's invention and the validity of the '411 patent.[167] Given these doubts, the court of appeals concluded that the preliminary injunction issued by the district court should have been rejected.[168]

There are several reasons to question the soundness of the court of appeals' analysis. First, it is unclear from the court's brief reassessment of the record what criteria of similarity the court was applying in evaluating and equating many features of the prior art systems and the patented purchasing method. The court's analysis simply cited a number of features of the prior art systems, asserted that they were similar to corresponding features of the patented system, and proceeded on without any evaluation or indication of why the identified similarities had engineering or information processing significance.

Beyond some ambiguity as to why it found these identified similarities to be significant, the court also failed to describe why it felt a practitioner with common skills would have been able to move easily from the prior art designs to the claimed invention in a way that rendered the latter obvious. The court gave no explanation of why analysts in the field of the Amazon.com advance would have assembled the snippets of design hints in the prior art to produce Amazon.com's one-click purchasing system. Even if one accepts the validity of the court's unstated criteria for measuring similarity, no single prior art system or reference analyzed by the court described anything close to the full range of the Amazon.com system. Even in the aggregate, these prior references and systems did not disclose all of the features of the Amazon.com one click purchasing procedure. To produce a design like that of the patented invention, designers in the same field of online shopping systems would have

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164 *Id.* at 1358.
165 *Id.* at 1360-65.
166 *Id.*
167 *Id.* at 1359.
168 *Id.* at 1356.

needed to combine and somewhat extend the teachings of these various prior art systems and references. Yet the court of appeals provided no explanation of why an analyst with common skills would have been likely to combine the teachings of the prior art in this way or to extend it towards the shopping system design solution represented by Amazon.com's patented system.

Absent evidence in the prior art of a reason why practitioners would be likely to combine the group of prior art teachings to produce the patented invention, the mere fact that a group of prior art teachings, taken as a whole, disclose most or all of the features of a patented invention does not establish that the invention was obvious.[169] In *Amazon.com* the court seems to have rejected Amazon.com's patent on precisely these flawed grounds.

The basic problem with the court of appeals' evaluation of invention obviousness is that it did not approach the design task underlying Amazon.com's innovation in the same way that computer specialists developing similar systems would have. Rather than scrutinizing prior online purchasing systems such as those described in the sources focused on by the court of appeals and then combining and extending the system design elements found in those prior art sources, developers of online shopping systems like that covered by Amazon.com's patent were much more likely to have developed new shopping software using prior non-computer shopping systems as models. Systems produced this way have more direct conceptual ties to earlier non-computer purchasing systems than they do to combinations of prior online systems. Hence, the obviousness of computer updates of purchasing systems such the one-click purchasing system covered by the '411 patent is best measured by reference to the non-computer purchasing systems which served as models for the updates. Obvious computer updates of earlier non-computer based purchasing methods would include those updates in which the information processing steps of earlier non-computer methods — or closely related steps modified to take advantage of well known computer capabilities — are implemented in computer systems through routine programming methods.

In sum, the court of appeals found the invention covered by the '411 patent to be similar to several prior art systems and vulnerable to obviousness challenges based on this similarity.[170] The district court found less similarity and no substantial obviousness challenges as a consequence.[171] Both the tests for similarity applied by these courts and the logic used by the courts to translate these findings of similarity or dissimilarity into conclusions about obviousness were unclear. Hence, the judicial analyses in *Amazon.com* provide little useful guidance for future obviousness evaluations of computer updates by courts, attorneys, inventors, patent owners, and potential infringers.

In order to improve these evaluations, the next section of this article proposes a simpler approach to assessments of invention obviousness in cases

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169 *See* ATD Corp. v. Lydall, Inc., 159 F.3d 534, 546 (Fed. Cir. 1998).

170 *Amazon.com, Inc.*, 239 F.3d at 1359-66.

171 *Id.* at 1358.

like *Amazon.com*. That section takes a detailed look at judicial evaluations of invention obviousness and identifies three approaches courts have used in performing these evaluations. Based on the broadest of these approaches — the evaluation of obviousness based on the reasoned extrapolation of prior art designs in accordance with design principles that are widely recognized in the relevant field of design — the next section argues that a wide range of computer-based updates of prior process and device designs are easily demonstrated to be obvious and unpatentable.

Under the proposed standard, computer updates that vary from prior non-computer designs only in the rearrangement or repetition of pre-existing features to make use of the exceptional and widely recognized speed or accuracy of computer processing generally are treated as obvious variations from their pre-computer counterparts and unpatentable.[172] Nonobvious computer updates are present where the addition of computer-based features to an earlier design produces new analytic or functional results that would be unexpected by computer update designers with common skills.[173]

IV. EVALUATING THE OBVIOUSNESS OF COMPUTER UPDATES OF PRIOR DEVICES AND PROCESSES

A. Statutory Standards

Federal statutory standards provide that:

> A patent may not be obtained though the invention is not identically disclosed or described . . ., if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.[174]

This statutory test focuses the rewards and costs of the patent system on a narrow group of inventions that constitute important additions to design knowledge because the innovations were unlikely to have been produced and brought to public availability through routine engineering efforts. As explained by Professor Donald S. Chisum,

> The general purpose behind the requirement of nonobviousness is the same as that behind the requirement of novelty. It serves to limit patent monopolies to those innovations that in fact serve to advance the state of

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172 *See infra* text accompanying notes 271-73.

173 An invention producing such unexpected results would be neither a direct update of prior mechanical devices or processes – because the invention produced different results – nor an obvious, predictably successful variation on such earlier devices or processes. Given its different operating results and unpredictably successful performance, such an advance would qualify as a nonobvious, potentially patentable invention under current standards. *See infra* text accompanying notes 236-37.

174 35 U.S.C. § 103 (2000).

> the useful arts. New problems arise and call for new solutions. A patent monopoly may issue only for those literally new solutions that are beyond the grasp of the ordinary artisan who had a full understanding of the pertinent prior art.[175]

B. The Graham Three-Step Analysis

In *Graham v. John Deere Co.*[176] the Supreme Court described a three-step analysis for evaluating the obviousness of an invention:

> [T]he scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background, the obviousness or nonobviousness of the subject matter is determined.[177]

In addition to this method of analyzing invention obviousness, the Supreme Court described several secondary factors that may provide circumstantial evidence that an invention was beyond the capabilities of practitioners with common skills and therefore nonobviousness. "Such secondary considerations as commercial success, long felt but unsolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented. As indicia of obviousness or nonobviousness, these inquiries may have relevancy."[178]

C. Special Problems in Evaluating the Obviousness of Computer Updates

Evaluations of the obviousness of computer updates of earlier devices or processes are particularly difficult and complex for a number of reasons. Each step of the three-step *Graham* inquiry may raise unusual issues when undertaken for computer updates.

1. Marshalling the Prior Art

a. Identifying Fields of Relevant Prior Art

The range of prior art to be considered in an invention obviousness analysis "is frequently couched in terms of whether the art is analogous, *i.e.*, whether the art is 'too remote to be treated as prior art.'"[179] Although all relevant prior knowledge is assumed to be available to the hypothetical practitioner with ordinary skill considered in an invention obviousness assessment, the notion of what is relevant knowledge effectively charges the practitioner addressing a design problem with "full knowledge . . . of the prior art in the field of his

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175 DONALD S. CHISUM, CHISUM ON PATENTS § 5.01 (1994).
176 383 U.S. 1 (1966).
177 *Id.* at 17.
178 *Id.* at 17-18.
179 *In re* Clay, 966 F.2d 656, 658 (Fed. Cir. 1992) (citation omitted).

endeavor . . . and knowledge from those arts reasonably pertinent to this particular problem."[180] Prior art that is relevant in assessing the obviousness of computer updates will include both prior computer programming examples and techniques and further knowledge from the application fields of the updates to the extent that this knowledge bears upon the information processing and other tasks performed by the updates.

In order to be considered relevant prior art, designs or documentary references from a field other than a practitioner's own must not only provide information about how to solve similar design problems, the practitioner must be reasonably expected or motivated to look to the other field for design solutions.[181] In the context of computer-implemented business methods, the relevant prior art includes similar non-computer based business practices (presumably a form of analogous art or even a version of the same art to the extent that a computer update is considered to be a successor in the same art to an earlier physical version). However, a wide variety of business practices and fields of use may provide background and prior art for a particular computer-implemented design. For example, purchasing practices and checkout methods from a variety of business fields may have provided relevant prior art background to the purchasing method at issue in *Amazon.com*.

The scope of relevant prior art regarding software advances like those used in computer updates may also be hard to gauge in invention obviousness evaluations because the relevance of past software designs to the computer application under evaluation may be unclear. While programming specialists recognize that some programming techniques can be reused in programs generally or in programs in a particular application domains,[182] many software designs rely on original processing sequences and data storage arrangements that are tied to the specific functional needs and details of their particular application settings. Given the context-specific character of their implementation details, the degree to which older, narrowly focused software designs would be viewed as prior art by programmers and inform subsequent programming projects — such as the creation of computer updates — is uncertain.

Prior art regarding computer updates of business methods may also be unusually hard to gather and analyze. As noted by one commentator, business methods are typically applied across multiple business fields, making practices in all of these fields relevant background to computer updates of the same business methods:

> For Internet business model patents, the focus of the claims tends to be primarily on a method of doing business; the business is just being conducted in the environment of the Internet. The relevance of the Internet environment is simply that software (*e.g.*, computer code) is

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180 *Id.* at 658-59.

181 *See In re* Oetiker, 977 F.2d 1443, 1447 (Fed. Cir. 1992).

182 *See, e.g.,* ROGER S. PRESSMAN, SOFTWARE ENGINEERING 17, 32-67 (2nd ed. 1987).

> instrumental in performing the method as opposed to "hardware" (*e.g.*, manual action). Looked at this way, the scope of the prior art is large indeed, due to the ubiquitous nature of business models.
>
> In business, as much as anywhere else, solving problems in one area by application of business principles or models from another area is clearly the norm. Case studies of diverse companies and industries are required components of undergraduate and graduate business programs. Methods used in providing goods in one industry are adapted to maximize profits in a totally unrelated industry. Yet, in the Internet business model area, a strange disconnect, evidenced in the Amazon.com case, is apparent between the real world and the electronic world.[183]

As an example of the many fields that may provide prior art background to a computer-based business practice, one commentator has suggested that past purchasing practices in fields as diverse as high-end hotels, bars, and feed stores would provide relevant prior art bearing upon the obviousness of the one-click purchasing method at issue in the *Amazon.com* case.[184]

b. Overcoming Gaps in Prior Art Evidence

Even when the relevant fields of prior art are identified, locating publicly available prior art related to computer updates may be unusually difficult. Software advances and related innovations such as computer-based business practices are particularly poorly described in publicly available records. In part, the unusual degree of concealment of innovations in this field stems from gaps in the accumulated body of patents for software and business method advances. This gap stems from a historical discontinuity in the perceived patentability of software and business method advances. Up until the mid-1990s, some federal courts and commentators cast doubts on whether software advances were patentable.[185] Hence, many innovators did not bother to seek patents for software advances and the corresponding set of accumulated patent disclosures that otherwise would have informed the public about these

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183 Margo A. Bagley, *Internet Business Model Patents: Obvious by Analogy*, 7 MICH. TELECOMM. & TECH. L. REV. 253, 274 (2001).

184 *See id.* at 272-73 & n.100. A similar uncertainty about the relevant prior art fields applies to evaluations of the obviousness of multimedia advances. As noted by one observer: "Multi-media professionals tend to view most of the patents they face as unequivocally obvious. Most of the controversial patents in the multi-media area are uninformative from a technological perspective. They merely claim to be the first to describe particular ways of organizing or accessing information. In such cases it is difficult to surmise what the field of art is if indeed there is one." U.S. Patent and Trademark Office, Public Hearing on the Standard of Nonobviousness (July 20, 1994) (statement of Brian Kahin, General Counsel, Interactive Multimedia Association) (on file with the author and Boston University Journal of Science & Technology Law).

185 These interpretations of software and business method patentability are profiled in Richard S. Gruner, *Intangible Inventions: Patentable Subject Matter for an Information Age*, 35 LOYOLA L.A. L. REV. 355, 382-97 (2002).

advances was not created.[186] More recent court holdings have confirmed the patentability of many software advances,[187] thereby encouraging more patent filings and improving patent records regarding recent software advances. However, this change has not improved older patent records and a gap from an earlier era still exists in software patent disclosures.

Aside from this historical gap in software patent records, prior art regarding software and business method advances that might provide background to computer updates may be unusually limited due to the secret use of innovative software and business methods. Public disclosures of software programming methodologies such as those used in computer updates may be unusually hard to find because these techniques have evolved rapidly in recent years, yet have not always been publicly revealed as they have changed.[188] Many businesses have found ways to use or market innovative software or business methods without revealing the details of the software programming or business methods to the public. These firms are able to capitalize on the commercial value of these innovations while protecting the innovations from misappropriation by competitors. They combat misappropriation through a combination of trade secret rights and physical security measures to ensure the secrecy of their innovative software and associated design details.[189]

To the extent that firms are successful in pursuing this type of trade secret protection for valuable software and business methods, the software and

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186 This problem was described by one computer specialist as follows: "Much of computer science I see . . . consists of reinventing wheels. A large amount of that is because people don't check prior art and a large amount of that is because there's no good prior art collections to check, and I think . . . that this is one of the problems that has been caused by the two decades of the Patent Office having at best ambivalent attitudes toward the patentability of computer software and not using the patent system to draw the trade secrets and the other art into the printed publications of U.S. patents." United States Patent and Trademark Office, Public Hearing on Patent Protection for Software-Related Inventions (Jan. 26-27, 1994) (statement of Lee Hollaar, Professor of Computer Science, University of Utah), *available at* http://www.uspto.gov/web/offices/com/hearings/software/sanjose/sj_hollaar.html (last accessed Mar. 21, 2003).

187 *See, e.g.,* AT&T Corp. v. Excel Communications, Inc., 172 F.3d 1352, 1353 (Fed. Cir. 1999) (patent covering a new electronic record keeping format for information on long distance calls); State Street Bank & Trust Co. v. Signature Fin. Group, Inc., 149 F.3d 1368, 1370 (Fed. Cir. 1998) (patent for a new data processing system used in investment management).

188 *See* United States Patent and Trademark Office, Public Hearing on Patent Protection for Software-Related Inventions (Jan. 26-27, 1994) (statement of Lee Hollaar, Professor of Computer Science, University of Utah, describing the tendency of some innovative software programming techniques to be used in significant programming projects without the techniques being disclosed to the public and added to searchable prior art records), *available at* http://www.uspto.gov/web/offices/com/hearings/software/sanjose/sj_hollaar.html (last accessed Mar. 21, 2003).

189 *See generally* RAYMOND T. NIMMER, THE LAW OF COMPUTER TECHNOLOGY ¶¶ 3.01-3.18 (2d ed. 1992).

methods involved are not revealed to the public and do not become part of the prior art that influences invention obviousness evaluations.[190] The withholding of information about such innovations leaves only a narrow body of prior art regarding computer innovations, which in turn expands the opportunity for designers of new computer updates to claim that their addition to publicly available computer programming or business method design knowledge is a nonobvious addition to the modest body of knowledge that has entered the prior art. Narrowly focused prior art only renders a small domain of closely related advances obvious, leaving other advances in the same general area to be viewed as nonobvious and potentially patentable.

2. Identifying New Invention Features

a. Comparisons to Prior Physical Designs

Even if the items of relevant prior art are clear, the second step in the *Graham* inquiry — determining the differences between the new features of a patented invention and the prior art — may be particularly difficult in evaluations of new computer updates of older physical designs. These evaluations will frequently require difficult comparisons of earlier physical processes and devices with newer, largely intangible computer-based equivalents. Analysts will need to identify the essential functional features of the older physical devices or processes and then to determine if their computer-based offspring have implemented these same features through some combination of computer processing and physical elements.[191]

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190 Such a strategy aimed at realizing commercial gain from a valuable software or business method innovation while maintaining the secrecy of that innovation will probably cause a company to forfeit any chance at obtaining a patent for the secret innovation. Under United States patent laws, commercial use of an innovation for more than a year prior to filing for a patent will typically cause the innovator to lose all opportunity to obtain a patent. *See* 35 U.S.C. § 102(b) (2000). This type of commercial use is treated as the equivalent of placing the innovation "on sale" more than one year before seeking a patent. Such a delay in seeking a patent, and the associated delay in full public access to the innovation involved upon expiration of a patent, will bar an innovator from obtaining the rewards associated with a patent. This is true whether or not the commercial use of the innovation was in secret. *See, e.g.,* Envirotech Corp. v. Westech Eng'g, Inc., 904 F.2d 1571, 1574 (Fed. Cir. 1990).

191 Comparisons of an innovation and prior art to determine the obviousness and patentability of the innovation must examine differences in the "subject matter as a whole." 35 U.S.C. § 103 (2000). "Both the Federal Circuit and the [Court of Customs and Patent Appeals] have interpreted the expression 'subject matter as a whole' [as] encompassing, not only the . . . subject matter [covered by patent claims and for which patent rights are asserted] but also the inherent properties of the claimed subject matter as well as the problems which were solved by it whether these were recited in the claims or not." U.S. Patent and Trademark Office, Public Hearing on the Standard of Nonobviousness (July 20, 1994) (statement of John O. Tresansky) (on file with the author and Boston University Journal of Science & Technology Law).

For example, many e-commerce applications covered by patent applications involve modifications to earlier practices used in physical stores and businesses. [192] The new information processing features of the computer updates typically entail changes that allow the updates to complete sales transactions more efficiently or with better customer service than in-store purchasing systems.[193] In evaluations of the obviousness of these e-commerce applications, the earlier practices are relevant prior art.[194] The obviousness of the e-commerce applications will depend on whether the computer capabilities added in the new e-commerce applications involve obvious modifications to the earlier process designs. However, the degree to which information processing elements have replaced physical design elements and the obviousness of those replacements may both be difficult to evaluate.

b. Similarities at Different Levels of Abstraction

Partial similarity between older designs and computer updates may complicate invention obviousness evaluations in other ways. At high levels of abstraction, extensive differences in physical implementation details may obscure similarities between computer updates and earlier physical process designs. Given that computer updates of earlier physical processes and devices often substitute information processing components for earlier physical device or process features, some differences in the form of these information processing additions will almost always distinguish computer updates from their non-computer predecessors.

Yet, to the extent that earlier designs and computer updates are built upon the same overall information processing models or operating metaphors, computer updates may be obvious variants of the prior physical designs constructed through routine adjustments to re-implement in software the information processing features already present in the prior designs. This will be true where computer implemented information processing has been substituted element by element for corresponding physical device or process parts in ways that are well understood by programmers. In such settings, the predictable success of the substitutions makes the new computer update an

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192 *See, e.g.,* U.S. Patent No. 5,960,411 (issued Sept. 28, 1999) (system updating retail purchasing sequences in physical stores); U.S. Patent No. 5,794,207 (issued Aug. 11, 1998) (system updating auction processes).

193 *See e.g., id.*

194 Earlier designs for sales processes in traditional physical stores or businesses are relevant prior art for assessments of the obviousness of e-commerce means for completing similar sales transactions. The earlier sales methods in traditional businesses are prior art to their electronic counterparts not only because the traditional and electronic processes fill same business roles, but also because designers of e-commerce business tools tend to obtain design ideas from earlier business practices in physical stores and establishments. These e-commerce innovators are typically familiar with their brick and mortar counterparts because the newer retailers compete with the earlier businesses. *See* Bagley, *supra* note 183, at 275-76.

obvious variation of its non-computer predecessor and the update should be treated as unpatentable.[195] However, the large number of new computer processing features in a later innovation, coupled with the apparent differences between the computer technologies and earlier physical technologies used in implementing shared operating metaphors, may obscure the similarity of information processing steps and consequent obviousness of a computer update incorporating those steps. In short, excessive attention to differences at the level of the implementation trees may obscure common features at the level of the design forest.

The converse may also be true. Computer-based designs that complete or aid in common business tasks may appear to simply replicate the designs of earlier physical processes or devices used for the same tasks, but may actually incorporate non-obvious design features at the operational detail level. That is, in redesigning an earlier process or device, a computer programmer may go beyond standard programming techniques and develop new, non-obvious computer processing methods. Alternatively, a programmer may have a new insight and realize that an old processing technique is unexpectedly suitable as a substitute for an earlier physical design element. In these types of settings, the unpredictable success and non-obviousness of the design details that are added to or substituted for elements of earlier physical devices or processes may render a computer update non-obvious and patentable. Excessive attention to similarities in operative results may cause analysts to ignore the extent and non-obviousness of these inner design differences, causing analysts to overestimate the obviousness of the new designs. This will, in turn, produce mistaken conclusions that the innovations are obvious and unpatentable.

c. Potential Locations of Non-obvious Design Features

New design characteristics that may constitute the non-obvious aspect of a computer update include new features in the update's internal structure, functional attributes, or practical results.[196] In evidentiary terms, this means that the nonobviousness of a computer update may be shown from evidence of new design structures or implementation details not present in the prior art, unexpected functional capabilities of the update compared with prior art devices and processes, or unexpected practical results achieved by users of the update.[197]

One type of new structural element that may establish the nonobviousness of a computer update is the inclusion of new information processing sequences not found in prior art devices or processes.[198] A new information processing

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195 *See In re* O'Farrell, 853 F.2d 894, 901-02 (Fed. Cir. 1988).

196 *See In re* Wright, 848 F.2d 1216, 1219 (Fed. Cir. 1988).

197 *See In re* Eli Lilly & Co., 902 F.2d 943, 948 (Fed. Cir. 1990).

198 *See* State Street Bank and Trust Co. v. Signature Fin. Group, 149 F.3d 1368, 1375 (Fed. Cir. 1998), *cert. denied*, 525 U.S. 1093 (1999) (holding that a computer-based invention is patentable if its method of information processing is new, non-obvious, and defined with adequate particularity).

method is sufficient to establish the non-obviousness of a computer update, since "non-obviousness could be found in the method [used to process information in a computer-based invention] and not its implementation."[199] Indeed, "[i]n many cases, the innovation in an Internet business model patent lies not in the computer programming associated with implementing the model, but instead in the 'idea' of, for example, allowing a computer to order an item by a single action, or 'haggling' over the price of an item."[200]

A second, related difference between computer updates and prior art designs that may establish the non-obviousness of the updates is the use of old information processing sequences in new contexts. A non-obvious computer update may result from the recognition that an information processing method already used somewhere else is relevant to achieving practical results in a new context. That is, an old information processing method may be part of a new, non-obvious computer update of an earlier device or process where it was not obvious that the old method would succeed if applied in the update.[201] By producing unexpectedly successful results through applying an old information processing method in a previously unpromising setting, an inventor produces a non-obvious and potentially patentable design. The unexpected success of the old method in this new context makes the new update design unlikely to have been pursued by others and, therefore, the type of non-obvious invention design that can qualify for patent incentives and protections.

A third type of new component in computer updates that may be a source of non-obviousness lies in the programming details that are used to implement the updates. Even if an update follows the overall information processing steps of a prior art design, the particular programming details used to do this may be new and different enough to render the update design non-obvious. Examples of potentially non-obvious programming elements capable of being implemented in computer updates include: new sorting techniques, new object-oriented programming methodologies, new data structures with functional implications, original programming languages, and innovative user interfaces.[202] Innovations of these sorts can produce new and non-obvious inner workings in computer updates that are otherwise closely modeled on old designs.

To the extent that the steps in an old information processing method dictate most of the programming details that must be used in a computer update to

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199 John Kasdan, *Obviousness and New Technologies*, 10 FORDHAM INTELL. PROP. MEDIA & ENT. L.J. 159, 163 (1999).

200 Bagley, *supra* note 183, at 276-77 (footnotes omitted). *See also* Jeffrey A. Simenauer, Note, *Patentability of Computer-Related Inventions: A Criticism of the PTO's View on Algorithms*, 54 GEO. WASH. L. REV. 871, 906-07 (1986) (arguing that the need for incentives for businesses to incur the costs of developing new, non-obvious algorithms for computer-based information processing justify patent protections for programs implementing the algorithms).

201 Simenauer, *supra* note 200, at 907.

202 Karjala, *supra* note 6, at 67, 70.

implement equivalent information processing sequences, these programming details are likely to be viewed as implied by the older method and therefore just obvious extensions of the method.[203] Likewise, where widely understood programming techniques provide standard computer programming methodologies for extending or modifying information processing sequences present in prior device or process designs, the computer updates that result may be viewed as obvious, unpatentable variations from the prior non-computer devices or processes.[204]

Finally, a fourth type of new design feature that may distinguish a computer update design from prior art designs is a different type of operating result achieved by the update. Where the operating results of an update are non-obvious in comparison with the results achieved by prior art designs, the update will be non-obvious and patentable. A new combination of old elements can be patentable where the elements interact in such manner as to produce a new, non-obvious, and unexpected result.[205] However, the results achieved must be substantially different than those produced by prior art devices or processes and may need to be different in kind rather than just degree.[206] Given that the results achieved were unexpected (at least in part), the apparent or predictable availability of these sorts of results would not have motivated most practitioners to adopt the same design approach. Without this motivation, practitioners with common skills would have been unlikely to pursue this design approach, meaning that it was unlikely to have been

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203 *See* Gary DuKarich, *Patentability of Dedicated Information Processors and Infringement Protection of Inventions that Use Them*, 29 JURIMETRICS J. 135, 158-59, 164 n.80 (1989) (arguing that, once a sequence of desired information processing has been determined, the creation of related computer code is largely dictated as well such that the remaining coding steps are obvious additions; these coding steps involve a discrete and relatively small number of coding choices that most colleagues would make similarly). "[I]t is well settled that it is not [a patentable] 'invention' to broadly provide a mechanical or automatic means to replace manual activity which has accomplished the same result." *In re* Venner 262 F.2d 91, 95 (C.C.P.A. 1958) (citation omitted). *See also In re* Rundell, 48 F.2d 958, 959 (C.C.P.A. 1931) (design that specified a previously existing device was to be operated automatically instead of by hand, without a claim specifying any particular automatic mechanism, was not a patentable advance over the prior art design of the previous device).

204 Karjala, *supra* note 6, at 67 (observing that "now that computer programming is a mature art, there may be few nonobvious new ways of organizing or structuring programs that will qualify" for a patent based on the originality of the structure, sequence, or organization of programming alone; a claim based on originality in this regard "would have to be directed toward a new and nonobvious way of constructing, structuring, or organizing programming elements (including, for example, the construction of data files) that has the useful effect of causing the computer to operate in the claimed (improved or better) manner.").

205 *In re* Kaufmann, 193 F.2d 331, 334 (C.C.P.A. 1952).

206 *See In re* Merck & Co., 800 F.2d 1091, 1098-99 (Fed. Cir. 1986).

discovered by these sorts of practitioners. Hence, the design is the type of rare, non-obvious design choice that can qualify for a patent.[207]

3. Evaluating the Ordinary Skill of the Average Practitioner

Once the differences between a computer update and the relevant prior art are identified, the last step in an invention obviousness evaluation requires an assessment of whether a practitioner with ordinary skill would be likely to produce a similar design given access to the same prior art.[208] This assessment may entail difficult questions about the nature of the practitioners whose skills are used to measure the obviousness of computer updates and the scope of ordinary skills and analytic abilities among those practitioners.

The set of practitioners whose abilities must be considered in determining the obviousness of a computer update is the group of product or process designers who are actively working on the same type of design problem as that addressed by the update.[209] However, in the context of computer updates, this group may involve several disparate types of product or process designers. Computer updates of earlier processes or products may stem from design efforts undertaken by experts in the fields of the prior devices or processes being updated, by computer programming specialists, or by some combination of these application domain and computer experts. Hence, the relevant pool of practitioners who are regularly working on computer updates is an ill-defined group. Uncertainty about the range of practitioners whose commonly held skills define the range of obvious and unpatentable computer updates complicate obviousness evaluations of computer updates.

Even if the appropriate practitioner group can be identified, the level of skill of the ordinary practitioner may be particularly hard to assess. According to one panel of the Court of Appeals for the Federal Circuit, "[a] person of ordinary skill is . . . one who thinks along the line of conventional wisdom in the art and is not one who undertakes to innovate. . . ."[210] Under this approach, the insights attainable through "conventional wisdom" or frequently undertaken modes of engineering analysis in a field define the range of design skills of the ordinary practitioner.[211] The application designs that are products of these conventional analyses are obvious and, therefore, unpatentable innovations.

In applying obviousness tests,

> [f]actors that may be considered in determining the level of ordinary skill in the art include: (1) the educational level of the inventor; (2) type of problems encountered in the art; (3) prior art solutions to those problems;

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207 *See id.*

208 *See* Graham v. John Deere Co., 383 U.S. 1, 17-18 (1966).

209 *See* Haworth, Inc. v. Steelcase, Inc., 685 F. Supp. 1422, 1434 (W.D. Mich. 1988), *aff'd*, 867 F.2d 615 (Fed. Cir. 1989).

210 Standard Oil Co. v. American Cyanamid Co., 774 F.2d 448, 454 (Fed. Cir. 1985).

211 *Id.*

(4) rapidity with which innovations are made; (5) sophistication of the technology; and (6) educational level of active workers in the field.[212]

Several of these features may be hard to gauge for developers of computer updates. For example, the educational background of computer programmers and domain experts who contribute to computer updates may differ widely, making it difficult to determine an average background. Rapid changes in computer technology produce equally rapid or fitful changes in computer updates that define no pattern of improvements in update-related knowledge or analytic techniques from which the common knowledge and knowledge extension abilities of update designers can be determined.

In addition, the range of technological advances that are obvious in creating computer updates depends in large measure on the degree of computer-related knowledge that is presumed in the person of ordinary skill in the computer update design field. How far this knowledge extends will depend greatly on whether the relevant practitioner community is considered to be computer programmers generally (in which case a broad range of presumed computer knowledge may be applicable), just experts in the application domain of the computer update (in which case a small range of presumed computer knowledge may be applicable), or some combination of these.

In the context of computer updates, the task of characterizing the common skills of practitioners may be made more complex by the need to consider the obvious implications of earlier business practices that provide prior art background to computer updates of those practices. Special standards for assessing the skills of average practitioners may be needed in business innovation settings such as competitive business environments. One commentator has argued that "a person of ordinary skill in the less technically intricate competitive arts requires far less in the way of suggestion or motivation to make connections among references."[213] If adopted, this interpretation would mean that the design extension skills of the average practitioner creating computer updates of business practices may be presumed to be particularly effective. This would cause a wide range of innovations to be considered implied and thus rendered obvious by one or more prior art designs.

Furthermore, designers pursuing computer updates to a prior business tool or practice may have background knowledge in several related fields that should be taken into account in assessing the design skills of the ordinary practitioner. For example, "because the competitive arts possess far greater inherent interconnectivity, someone of ordinary skill in one of these arts (marketing, for example) should normally be credited with a working familiarity of a substantial range of other business practices (sales, order

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212 Envirtl. Designs, Ltd. v. Union Oil Co., 713 F.2d 693, 696 (Fed. Cir. 1983), *cert. denied*, 464 U.S. 1043 (1984).

213 Vincent Chiappetta, *Defining the Proper Scope of Internet Patents: If We Don't Know Where We Want to Go, We're Unlikely to Get There*, 7 MICH. TELECOMM. & TECH. L. REV. 289, 352 (2001).

processing and fulfillment, etc.)."[214] This presumed familiarity with a broad range of prior knowledge would further narrow the range of innovations that could be considered non-obvious.

V. DETERMINING THE SCOPE OF OBVIOUS DESIGN EXTENSION INSIGHTS

A. The General Standard

The final issue in determining the obviousness of a computer update of a prior device or process is whether the update's new features would probably be perceived as desirable design advances by a practitioner having ordinary skills in the field of the advance and full access to the relevant prior art.[215] A new design approach will generally be considered obvious and unpatentable where the prior art suggests the probable success of the design approach or where a minimal amount of experimentation could confirm that success.[216] "There must be a teaching or suggestion within the prior art, or within the general knowledge of a person of ordinary skill in the field of the invention, to look to particular sources of information, to select particular elements, and to combine them in the way they were combined by the inventor."[217]

B. Avoiding Hindsight Bias

In evaluating the obviousness of a given design solution, courts have been careful to avoid hindsight bias — that is, a bias toward finding inventions obvious based on hindsight. An obviousness analysis must focus on the prior art and the ordinary skills of practitioners as they existed at the time of invention. Courts must exclude from consideration any additions to technical knowledge or practitioner skill that occurred after the date of the invention. However, exclusion of this after-acquired knowledge and skill is often very difficult. What appears in hindsight as a simple and obvious basis for formulating a new design is not enough to establish obviousness for patent law purposes. Rather, a party seeking to establish that an invention was obvious under patent law must be able to point out, based on information in the prior art existing at the time of the invention, a reason why the new design reflected in the invention would have seemed desirable and worth pursuing to a person having ordinary skills in the relevant design field.[218]

To combat possible hindsight bias, courts have required that findings of obviousness be supported by clear evidence in the prior art indicating the

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214 *Id.*

215 *See* Graham v. John Deere Co., 383 U.S. 1, 17-18 (1966).

216 *See, e.g.*, ATD Corp. v. Lydall, Inc., 159 F.3d 534, 546 (Fed. Cir. 1998).

217 *Id.* The ultimate question regarding the obviousness of a new combination of elements constituting a new invention is "whether there is something in the prior art as a whole to suggest the desirability, and thus the obviousness, of making the combination." *In re* Rouffet, 149 F.3d 1350, 1355-56 (Fed. Cir. 1998) (citations omitted).

218 *See* Uniroyal, Inc. v. Rudkin-Wiley Corp., 837 F.2d 1044, 1052 (Fed. Cir. 1988).

probable success and, therefore, the likely pursuit of an invention by persons having ordinary skills in the same field. "Our case law makes clear that the best defense against the subtle but powerful attraction of a hindsight-based obviousness analysis is rigorous application of the requirement for a showing of the teaching or motivation to combine prior art references."[219] Prior art evidence of the likely success of a particular design is taken as an indication that practitioners with ordinary skills would both formulate and pursue that design approach, bringing the design approach within the range of obvious designs that would be likely to come to public attention without the need for patent incentives. Since patent incentives are generally superfluous for inventions that will probably come to the public without these incentives, obvious inventions are excluded from patent protections to avoid unproductive patent restrictions and costs.[220]

Hindsight problems may be particularly difficult concerning computer updates that provide apparently simple solutions to complex design deficiencies. Such solutions, by their very simplicity, may appear obvious in retrospect. However, at least where the means of implementing the same simple solution were available but not applied for some time, the long delay in producing a particular design suggests that the design was not easily produced by practitioners with ordinary skills and was therefore non-obvious for patent law purposes. A simple solution to a long-standing, complex problem requiring design insight or effort outside of the course of normal design development is precisely the sort of rare invention that should be considered non-obvious and specially encouraged by patent incentives and rewards. As noted by one commentator:

> A complex solution to a complex problem is always appreciated because the complexity is very impressive. But a simple solution to a difficult problem is not very impressive.
>
> First of all, the problem goes away. The difficult problem doesn't exist anymore because there's a simple solution.
>
> Second of all, it's so obvious in hindsight that everyone looks at it from the standpoint of well, it was obvious to me, everyone was thinking about it, it was in the air. It's very, very easy to fall into the problem of hindsight obviousness and motivation is very, very important, particularly for the inventions that are simple answers to complex problems, rather than complex answers to complex problems.
>
> I think that it's generally admitted that a simple solution to a complex problem is one of the higher levels of invention and we must maintain some way to reward a simple solution to a complex problem.[221]

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219 *In re* Dembiczak, 175 F.3d 994, 999 (Fed. Cir. 1999). *See also* Ruiz v. A.B. Chance Co., 234 F.3d 654, 664 (Fed. Cir. 2000).

220 *See In re* Dembiczak, 175 F.3d 994, 999 (Fed. Cir. 1999).

221 U.S. Patent and Trademark Office, Public Hearing on the Standard of

C. Methods for Extending Prior Art

A new computer update design typically builds upon prior art designs in one of two ways: 1) the new design modifies or adds to design elements that are already present in a single design disclosed in one prior art source or 2) the new design involves a combination of features found in multiple designs disclosed in several prior art sources. Each of these types of expansions on prior art designs involves different problems in evaluating the obviousness of computer updates.

1. Modification of a Single Prior Art Design

Computer updates extending a single prior art design can be derived from two very different bodies of prior art designs. Some updates are based on prior art designs involving physical devices or processes. Others expand upon or modify prior computer processing designs. Either type of update may involve obvious or non-obvious variations on or additions to the prior art.

Where computer updates merely replicate the processing steps of earlier business methods or physical devices, some commentators have argued that the resulting designs are so completely dictated by their physical precursors that the designs should be considered obvious per se.[222] However, this view overlooks the possibility that computer updates may add non-obvious features to their physical precursors by incorporating new and non-obvious processing steps, programming details, or processing results.[223]

Rather than treating physical predecessors as rendering obvious all computer updates derived from those predecessors, some courts have gone to the opposite extreme and largely ignored physical device or process prior art in determining the obviousness of computer updates.[224] These courts have assessed the obviousness of computer updates solely in terms of other computer processing designs, thereby ignoring the possibility that the updates are obvious because they involve the addition of standard computer processing techniques to mimic information processing features dictated or implied by the designs of previous physical devices or processes.[225] This approach simply

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Nonobviousness (July 20, 1994) (statement of Gilbert P. Hyatt) (on file with the author and Boston University Journal of Science & Technology Law).

222 Jared Earl Grusd, *Internet Business Methods: What Role Does and Should Patent Law Play?*, 4 VA. J.L. & TECH. 9, ¶ 70 (1999), *at* http://www.vjolt.net/vol4/issue/v4i2a9-grusd.html (arguing that "courts should not allow patents for Internet business methods that merely apply traditional business methods to the Internet" because such Internet-oriented extensions of the traditional methods should be viewed as obvious variations on the earlier practices in all cases).

223 *See supra* text accompanying notes 198-202.

224 *See generally* Amazon.com, Inc. v. Barnesandnoble.com, Inc., 239 F.3d 1343 (Fed. Cir. 2001); Amazon.com, Inc. v. Barnesandnoble.com, Inc., 73 F. Supp. 2d 1228 (W.D. Wash. 1999).

225 *See* Bagley, *supra* note 183, at 271-72 (noting the failure of the district court in Amazon.com to properly consider analogous art in failing to address "bricks and mortar"

gives too little weight to physical designs as models or guides for their computer processing successors.

While some computer updates are derived primarily from physical predecessor devices and processes and their obviousness should be gauged in relation to those physical predecessors, other computer updates have a background and heritage in prior computer systems. These computer updates are the end products of a sequence of computer programming implementations. In these situations, earlier computer update designs may serve as prior art rendering later versions of computer updates in the same field obvious and unpatentable. Obviousness determinations based on earlier computer systems may be simpler than similar evaluations involving prior art comprised of physical devices or processes. The computer system to computer system comparisons involved in assessing multiple generations of updates often involve information processing and computer programming design elements that match with greater similarity in invention to prior art comparisons than the computer system to physical device comparisons which determine obviousness when computer updates are evaluated against prior art comprised exclusively of earlier physical devices and processes.

For example, a relatively simple comparison of multiple generations of computer updates of telephone record keeping systems was sufficient to resolve the obviousness of a computer update in *AT&T v. Excel Communications, Inc.*[226] There, the patent in dispute covered a computer-based record keeping system involving the generation of message records for long distance telephone calls.[227] The system produced records on various features of the calls including which long distance carriers the callers were using.[228] The court compared this patented system with prior art involving the "Friends and Family" computer-based record system of a competitor.[229] The patented invention was found to be obvious because the prior system incorporated most of the features of the claimed system and an average practitioner would have known (based on commonly held skills and knowledge) that a customer information database could be used to implement the further functionality which distinguished the patented system from the Friends and Family system.[230] Because the court was able to resolve the obviousness issues in terms of a relatively simple comparison between the computer system features of the prior and patented systems, the court in *AT&T* did not need to consider the more difficult question of whether the claimed record system was merely an obvious derivative of prior physical systems involving paper records created by hand and kept in physical files. Were the

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practices, considering only e-commerce references and the range of practices that were obvious from those references).

226 52 U.S.P.Q.2d (BNA) 1865, 1999 WL 1050064 (D. Del. 1999).

227 *Id.* at *1.

228 *Id.* at *2-3.

229 *Id.* at *18.

230 *Id.* at *22.

AT&T system the first computer-based record keeping system of its type, a comparison of the system to its physical record keeping predecessors would have been necessary to determine the obviousness of this system and the validity of AT&T's patent.

2. Combination of Two or More Prior Art Designs

If a computer update combines design elements described in two or more prior art references, the update can be found to be an obvious innovation for patent law purposes only if there is some evidence either in the prior art or in other knowledge commonly held by practitioners in the field which explains why a practitioner with ordinary skills would be likely to combine the information in the multiple references to produce a design like that of the update.[231] Thus, to establish that the combination of two prior art references rendered a patented invention obvious, the prior art or prevailing knowledge in the field must provide "reasons why one skilled in the art would have substituted an element of teaching of a first reference for that part of the second" in a way that would probably have produced the patented invention.[232]

Even if the prior art somehow indicates that it may be advantageous to combine different design features described in multiple prior art sources, the combination is only obvious if the components still operate in the manner described in the earlier references. New and unexpected functional results of a combination of prior art elements will typically render the combination non-obvious. As noted by one court,

> [t]here must be a particular reference, the design characteristics of which are basically the same as the patented design. That single reference may then be combined with modification suggested by secondary references. The modification necessary to the primary reference in order to achieve the patented design may not destroy fundamental characteristics of the primary reference.[233]

Because software developers may not clearly document the reasons for combining previously known elements in new designs, the grounds for making such combinations may not appear in the prior art. Consequently, a wide variety of new combinations of old software elements may qualify as non-obvious innovations due to a lack of prior art evidence of reasons to make the combinations. At least one commentator has argued that this is an appropriate result because these sorts of combinations of software elements commonly

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231 U.S. PATENT & TRADEMARK OFFICE, MANUAL OF PATENT EXAMINING PROCEDURE § 2143.01 (8th ed. 2001).

232 Kenneth R. Adamo, *The Power of Suggestion (Teaching, Reason or Motivation) and Combined-Reference Obviousness*, 76 J. PAT. & TRADEMARK OFF. SOC'Y 177, 184 (1994). *See also Ex parte* Skinner, 2 U.S.P.Q.2d (BNA) 1788, 1790 (Bd. Pat. App. & Interferences 1986).

233 Benchcraft, Inc. v. Broyhill Furniture Ind., Inc., 681 F. Supp. 1190, 1215 (N.D. Miss. 1988), *vacated and remanded by* 871 F.2d 1096 (Fed. Cir. 1989).

require original insights. In this commentator's estimation "although everyone claims that anything can be done through a simple matter of programming, many of the features require the spark of genius that [is characteristic of] patentable subject matter in order to ignite the inventor's mind into creating the combination of software elements necessary to enable the invention."[234]

The malleability of software makes new combinations of old software components particularly easy to create in applications such as computer updates. However, unless there are clear indications in the prior art as to why a combination would be desirable, combinations of old software elements to produce computer updates will not be obvious for patent law purposes.

D. Bases for Obviousness of a New Design

Recent judicial assessments of the obviousness of inventions have focused on three independently sufficient reasons why an invention may be obvious and unpatentable: 1) the design of the invention was suggested by the prior art, 2) the prior art provided motivation to adopt new features of the invention to obtain some needed functionality, or 3) the invention reflects the reasoned optimization or extension of the prior art in accordance with commonly held design principles.[235]

1. Suggestions in Prior Art of Likely Success in Solving Problem

Prior art sufficiently suggests a new invention and makes that invention obvious where an average practitioner, in reviewing the prior art, would anticipate that the new features of the invention would be successful in solving the practical problem to which the invention is directed.[236] This will be true where the prior art suggests both the nature of the new design and its overall functional attributes. An assessment of whether a patented invention was obvious in light of prior art requires

> consideration of two factors: (1) whether the prior art would have suggested to those of ordinary skill in the art that they should make the claimed composition or device, or carry out the claimed process; and (2) whether the prior art would also have revealed that in so making or carrying out, those of ordinary skill would have a reasonable expectation of success.[237]

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234 U.S. Patent and Trademark Office, Public Hearing on the Standard of Nonobviousness (July 20, 1994) (statement of Keith Stevens, Corporate Counsel, Taligent, Inc.) (on file with the author and Boston University Journal of Science & Technology Law).

235 "Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art." U.S. Patent & Trademark Office, *supra* note 234.

236 *In re* Vaeck, 947 F.2d 488, 493 (Fed. Cir. 1991).

237 *Id.* *See also In re* Dow Chemical Co., 837 F.2d 469 (Fed. Cir. 1988); Varma &

Thus, for example, in *In re O'Farrell*,[238] the Court of Appeals for the Federal Circuit concluded that the obviousness of a claimed invention was established where a particular reference described 1) a detailed methodology for producing the invention, 2) a suggestion to modify the prior art to produce the claimed invention, and 3) evidence suggesting that the modification would be successful.[239]

> To provide sufficient evidence of obviousness, prior art must suggest putting together:
>
> the combination of separate elements into the claimed invention in suit, not just . . . [describe] separate elements [comprising the disputed invention]. . . . To illustrate this notion, you cannot claim that the existence of a unicorn should be obvious from taking a trip to the zoo and seeing a horse and a white rhinoceros in adjacent cages. It takes a spark of inventiveness to look at a horse and then look [at] a white rhinoceros and then conceive the idea of a white horse with a horn.[240]

In determining whether prior art suggests a particular modification or addition, a fact finder must examine the total information the prior art conveys to a practitioner with ordinary skills. Hence, in *In re Young*,[241] the Court of Appeals for the Federal Circuit indicated that the Board of Patent Appeals and Interferences should, in determining whether prior art rendered an invention obvious:

> weigh each reference for its power to suggest solutions to an artisan of ordinary skill. The Board must consider all disclosures of the prior art . . . to the extent that the references are, as here, in analogous fields of endeavor and thus would have been considered by a person of ordinary skill in the field of the invention. The Board, in weighing the suggestive power of each reference, must consider the degree to which one reference might actually discredit another.[242]

2. Motivations to Pursue to Gain Functionality Needed in Solving Problem

A new design approach may also be considered obvious if the prior art provides a motivation to adopt the new features of the design as a means to achieve some functionality needed in a component of that design.[243] Prior art

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Abraham, *supra* note 61, at 81.

238 *See In re* O'Farrell, 853 F.2d 894 (Fed. Cir. 1988).

239 *See id.* at 902.

240 Laitram Corp. v. Cambridge Wire Cloth Co., 226 U.S.P.Q. (BNA) 289, 293 (D. Md. 1985), *aff'd in part*, *rev'd in part, and remanded*, 785 F.2d 292 (Fed. Cir. 1986), *cert. denied*, 479 U.S. 820 (1986).

241 927 F.2d 588 (Fed. Cir. 1991).

242 *Id.* at 591.

243 *See, e.g.*, Winner Int'l Royalty Corp. v. Wang, 202 F.3d 1340, 1349 (Fed. Cir.

may create a sufficient motivation to try a new design approach for a particular invention element even though the approach has never previously been used or suggested for designs in the field of the present application.[244] The functional potential of the new approach as identified in the prior art, coupled with the need for corresponding functionality in a particular type of design project, makes it likely that the approach would be tried by the ordinary practitioner in pursuing that type of project.[245] This likelihood of pursuit and reinvention by the common practitioner, in turn, makes the approach obvious and unpatentable.

This motivation test differs from the suggestion standard previously discussed. While the suggestion test focuses on suggestions in the prior art of the overall design approach or total set of new design features comprising an invention, the motivation test operates at the level of invention components.[246] Thus, an invention is obvious based on motivating prior art if the prior art gives a designer a reason to try a new design approach to achieve the functionality needed in a design component. The new design approach may previously have had nothing to do with the design field where the approach is now being applied – the approach just provides the functionality now needed in that field. By contrast, an invention is suggested by the prior art where the overall set of design features or structures comprising the invention were identified by one or more sources in the prior art as potentially desirable as a set.

Information in the prior art will provide a sufficient motivation to pursue a particular design approach if the information causes a practitioner with common skills to expect that this approach will be likely to deliver a type of functionality that is helpful in solving a practical problem. "The motivation to make a specific structure 'is not abstract, but practical, and is always related to the properties or uses one skilled in the art would expect the [structure] to have, if made.'"[247]

Prior art may provide this type of motivation by revealing a reason why a new design approach would improve a type of functionality already present in the earlier designs of a device or process. Thus, a motivation to try a new approach is present if "a combination of the teachings of all or any of [several prior art] references would have suggested (expressly or by implication) the possibility of achieving further improvement by combining such teachings

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2000); *In re* Sernaker, 702 F.2d 989, 994 (Fed. Cir. 1983).

244 *Winner Int'l Royalty Corp.*, 202 F.3d at 1349.

245 *See* James W. Badie, *"Motivation" or "Obvious to Try" – Is There a Difference? Is It a Proper Test of Obviousness?*, 75 J. PAT. & TRADEMARK OFF. SOC. 54, 61 (1993) (concluding that for a motivation to be present in the prior art so as to render an invention obvious, "the prior art must move, impel, induce or incite one skilled in the art to make the invention.").

246 *See id.* at 62-63.

247 *In re* Newell, 891 F.2d 899, 901 (Fed. Cir. 1989) (quoting *In re* Gyurik, 596 F.2d 1012, 1018 (C.C.P.A. 1979)).

along the lines of the invention [under analysis]."[248] A sufficient motivation to adopt a new design approach can be shown from prior art references if the approach appeared likely from those references to provide a desirable gain in functionality**,** taking into account the approach's apparent advantages and disadvantages.[249]

Information in prior art sources must make a new design approach more than just obvious to try in order to render that approach unpatentable. Rather**,** there must be some indication in the prior art that the new approach had a reasonable chance of success in solving the design problem at issue.[250] Whether or not there would have been a reasonable expectation of success is evaluated from the perspective of the person of average skill in the relevant art, not the often heightened level of skill of the inventor seeking a patent.[251]

Moreover, portions of the prior art that teach away from the claimed invention may indicate that a person with ordinary skill in the art would not have thought that the design approach adopted in that invention had a reasonable chance of success. [252] Thus, sources criticizing or debunking the adopted design approach must also be considered in assessing the obviousness of a new design.[253]

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248 *In re* Sernaker, 702 F.2d 989, 994 (Fed. Cir. 1983).

249 *See Winner Int'l Royalty Corp.*, 202 F.3d at 1349 (noting that "although there was conflicting evidence before the district court on whether one would see the trade-off between using a dead-bolt and using a ratcheting mechanism and conclude that the more secure dead-bolt should be replaced with the more convenient ratcheting mechanism, the district court did not clearly err in finding that one of ordinary skill in the art would not have reasonably elected trading the benefit of security for that of convenience. Trade-offs often concern what is feasible, not what is, on balance, desirable. Motivation to combine requires the latter.").

250 *See* Merck & Co. v. Danbury Pharmacal, Inc., 694 F. Supp. 1, 29 (D. Del. 1988), *aff'd*, 873 F.2d 1418 (Fed. Cir. 1989) ("the governing standard is emphatically not whether a particular method or process leading to an invention would be 'obvious to try' . . . but whether such an experiment would have been expected to succeed. Moreover, this expectation must be measured with deliberate avoidance of hindsight assessment. However, the standard does not require 'absolute predictability.'").

251 Life Techs., Inc. v. Clontech Labs., Inc., 224 F.3d 1320, 1326 (Fed. Cir. 2000) (stating that reasonable expectation of success is "assessed from the perspective of the person of ordinary skill in the art" and that the lower court's use of the inventor's success as evidence that success would have been expected represented "impermissible use of hindsight").

252 *In re* Dow Chemical Co., 837 F.2d 469, 473 (Fed. Cir. 1988).

253 *Id.* (stating that the assessment of the obviousness of a new design depends on "whether the prior art would have suggested to one of ordinary skill in the art that this process should be carried out and would have a reasonable likelihood of success, viewed in the light of the prior art . . . . In determining whether such a suggestion can fairly be gleaned from the prior art, the full field of the invention must be considered; for the person of ordinary skill is charged with knowledge of the entire body of technological literature, including that which might lead away from the claimed invention."). *See also* Tec Air, Inc. v. Denso Mfg. Michigan, Inc., 192 F.3d 1353, 1360 (Fed. Cir. 1999) ("There is no

An analysis of whether the prior art creates a sufficient motivation to adopt a particular design approach should focus on motivations to add functionally significant features to prior designs, not features constituting mere "window dressing."[254] Non-functional "window dressing" elements of a new invention should therefore be disregarded in determining differences of the invention from the prior art and whether there were motivations based on the prior art encouraging an ordinary practitioner to adopt those differences. If courts do not disregard nonfunctional "window dressing" features in evaluating the obviousness and patentability of inventions, an invention might be found nonobvious and patentable solely because there was no motivation provided by the prior art for adding what is in fact a nonfunctional aspect to a prior design.[255]

3. Reasoned Extrapolation of Prior Designs

Factors other than a direct suggestion or motivation of a new design approach in the prior art may show an invention's obviousness. A showing of obviousness to an ordinary artisan can be based on other factors if there is "a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of [the prior art] references."[256] As the Supreme Court stated in *Hotchkiss v. Greenwood*,[257] if the insights and skills possessed by an "ordinary mechanic" in a design field would have been sufficient to allow such a person to modify prior designs to produce an invention, then the invention was obvious and unpatentable. *Hotchkiss* involved a patent on a door knob made of clay. The clay material from which the door knob was formed was previously known, but the patented design called for the previously untried attachment of the clay material to a shank and spindle structure like that used in other door knobs.[258] In finding this modification of prior art door knob designs to be unpatentable, the Supreme Court emphasized the need for patentable inventions to involve the application of knowledge beyond that held by every "ordinary mechanic" in the same design field:

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suggestion to combine . . . if a reference teaches away from its combination with another source. . . . If when combined, the references 'would produce a seemingly inoperative device,' then they teach away from their combination."); *In re* Gordon, 733 F.2d 900, 902 (Fed. Cir. 1984) (finding no suggestion to modify a prior art device where it appeared that the modification would render the device inoperable for its intended purpose).

254 *See* U.S. Patent and Trademark Office, Public Hearing on the Standard of Obviousness (July 20, 1994) (statement of Karl A. Limbach, representing Seagate Corporation) (on file with the author and Boston University Journal of Science & Technology Law).

255 *Id*.

256 *Ex parte* Clapp, 227 U.S.P.Q. (BNA) 972, 973 (Bd. Pat. App. & Interferences 1985).

257 52 U.S. 248 (1850).

258 *Id*. at 264.

> [U]nless more ingenuity and skill in applying the old method of fastening the shank and the knob were required in the application of it to the clay or porcelain knob than were possessed by an ordinary mechanic acquainted with the business, there was an absence of that degree of skill and ingenuity which constitute essential elements of every invention. In other words, the improvement is the work of the skillful mechanic, not that of the inventor.[259]

The perfection of workmanship is not sufficient to produce non-obvious improvements to prior, unperfected designs. According to the Supreme Court, "[a]n instrument or manufacture which is the result of mechanical skill merely is not patentable. Mechanical skill is one thing; invention is a different thing. Perfection of workmanship, however much it may increase the convenience, extend the use, or diminish expense, is not patentable."[260]

One group of commentators has identified innovations that modify prior art designs in accordance with field-specific principles of design optimization as being among those engineering advances that are inherently obvious based on the generally held skills and knowledge in the field.[261] They argue that case law concerning the "implicit suggestions" of prior art is broad enough to support the view that new design directions are suggested (and therefore obvious) where the directions entail optimization of designs in the prior art along lines of improvement that are well recognized in the same field of design. These types of changes to the prior art "are obvious even *without* an explicit suggestion that they be pursued."[262]

Examples of reasoned optimization processes that lead to obvious new designs include:

> 1) a substitution of one material for another where the two are understood to have similar features in the respect required in the design at hand or
>
> 2) an exercise of mechanical judgment in determining the optimal value for some design feature in terms of previously understood principles for determining or predicting the optimal value.[263]

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259 *Id*. at 267. *See also* Atlantic Works v. Brady, 107 U.S. 192, 200 (1882) (finding that unpatentable new designs are those "which would naturally and spontaneously occur to any skilled mechanic or operator in the ordinary progress of manufactures").

260 Reckendorfer v. Faber, 92 U.S 347, 356-57 (1875). *See generally* Sirilla, *supra* note 23, at 487-92, 517-24.

261 *See* ROBERT P. MERGES ET AL., INTELLECTUAL PROPERTY IN THE NEW TECHNOLOGICAL AGE 213 (2d ed. 2000).

262 *Id*.

263 *See* Smith v. Goodyear Dental Vulcanite Co., 93 U.S. 486, 494-96 (1876) (suggesting that new design features developed in this way – or at least capable of being developed in this way given the state of the prior art – would lack the degree of inventive effort needed for patenting). *See also* ERNEST BAINBRIDGE LIPSCOMB III, LIPSCOMB'S WALKER ON PATENTS § 6:4, at 22 (3d ed. 1985) ("A mere carrying forward or more

In these circumstances, the resulting new designs are predictably successful based on well understood engineering principles in the relevant design fields. This predictability of success indicates that the designs are obvious choices and unpatentable.

In some fields**,** the scope of design changes producing predictable alterations in functionality is very narrow. Where this is the case, a wide range of new designs will have unpredictable functionality and consequently, will qualify as nonobvious variations from the prior art.[264]

Only those inventions that reflect "new paradigms, or significant discontinuities from what has been done previously" are patentable under this view.[265] Patentable inventions involve discoveries beyond the limits of the imagination of the ordinary skilled person, in light of established principles for predicting the functional implications of design changes.[266] According to Judge Learned Hand, "it is the conception that counts, the act of imagination which assembles the elements into the new and fruitful combination; not the working out of details."[267] Patents should "go to those who contribute new appliances that are beyond the limited imagination of the ordinary skilled person. . . ."[268] Thus, the inquiry into the proper range of patentable inventions involves "an attempt to reconstruct the scope and limits of imagination of the ordinary skilled man."[269] Applying this standard to computer updates, obvious and unpatentable computer updates are those which supplement prior physical devices and processes with well understood information processing steps and computer programming techniques, since the imagination of common artisans would perceive such updates as probably successful designs.

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extended application of the original thought, a change only in form, proportions or degree, or the substitution of equivalents doing substantially the same thing in the same way by substantially the same means with better results is not such invention as will sustain a patent.").

264 For example, chemical engineering is governed by this rule of limited predictability, with small structural changes in chemical compounds often producing large and unexpected changes in chemical characteristics. ROSENBERG, *supra* note 27, § 9.04[9] (noting that "the relatively unpredictable nature of chemistry presents more opportunities for nonobvious subject matter" since small changes in chemical compositions often produce large and nonobvious results).

265 Chiappetta, *supra* note 213, at 337-38 (arguing that inventions that are in accordance with prevailing engineering views should be treated as obvious and unpatentable).

266 Automatic Devices Corp. v. Cuno Eng'g Corp., 117 F.2d 361, 364 (2d Cir. 1941) (Hand, J.), *rev'd on other grounds*, 314 U.S. 84 (1941).

267 *Id.* at 363.

268 *Id*. at 364.

269 Wire Wheel Corp. v. C.T. Silver, Inc., 266 F. 221, 227 (S.D.N.Y. 1919) (Hand, J.), *aff'd*, 266 F. 229 (2nd Cir. 1920).

VI. A PROPOSED OBVIOUSNESS STANDARD FOR COMPUTER UPDATES

A. Applying General Obviousness Standards to Computer Updates

While they may have some impact in cases where computer updates involve incremental improvements over prior computer-based systems, the suggestion and motivation standards for invention obviousness described above may be awkward to apply to computer updates that are based primarily or exclusively on the design features of prior physical devices or processes.[270] These standards will be difficult to apply where computer updates are modeled directly on the features of physical devices or processes, because the updates will incorporate computer processing techniques that were not present in the physical devices or processes that preceded the updates. These new processing techniques or other computer-based inventions similar to the updates may not appear in the relevant prior art. Therefore, the suggestion and motivation tests may not yield meaningful results, as these tests turn on comparisons of new invention elements with similar overall designs or elements described in the prior art.

However, the absence of suggestive or motivating prior art will not preclude obviousness evaluations of computer updates under the rational optimization standard outlined above. These sorts of evaluations will be possible where general principles of computer processing design indicate how physical device and process features could be translated into equivalent computer processing steps, and how those steps might be adjusted or augmented to optimize the operation of a new computer update of an older device or process.

In essence, this method of analyzing the obviousness of computer updates recognizes that these updates are often products of two types of design processes, each dictated by standard design practices in the computer processing field. The first design process involves the step-by-step replication in computer processing of the information processing steps present in a physical device or activity. The second process involves the adjustment or

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270 In some cases, computer updates will have backgrounds in both prior computer systems and earlier physical devices or processes. For example, in *Amazon.com, Inc. v. Barnesandnoble.com, Inc.*, 239 F.3d 1343 (Fed. Cir. 2001), the invention at issue had predecessors in both computer-based purchasing systems and earlier purchasing practices in stores. *See supra* text accompanying notes 103-15. In evaluating the obviousness of this invention, the court of appeals compared the online purchasing system at issue only to earlier computer-based systems. *See Amazon.com, Inc.*, 239 F.3d at 1359-66. While this type of computer system to computer system comparison may be sufficient to evaluate innovations that are relatively late-stage refinements to designs in a given field, they will not provide means to evaluate the first generation computer updates in a given area or even late stage updates that reflect fundamentally different design features than earlier computer-based systems. First generation updates and later fundamental departures, to the extent that their features are modeled on the information processing characteristics of earlier physical devices or processes, will need to be compared to their physical counterparts to determine invention obviousness and patentability.

optimization of the resulting computer processing steps to improve the performance of the computer system. Where both of these steps are undertaken in accordance with well understood design principles in the computer programming field – the equivalent of "good workmanship" standards in other physical design domains – the resulting computer update designs should be considered obvious and unpatentable.

B. Criteria for Assessing the Obviousness of Computer Updates

Building on the notion that these two types of design processes undertaken in accordance with commonly held design principles will produce obvious designs, three specific design principles from the computer field support a specialized standard for evaluating the obviousness of many computer updates of earlier physical designs. These three commonly held design principles, each well documented in the prior art of the computer programming field, are:

1) Any well understood sequence of steps for physical processing of information can be translated into an equivalent sequence of computer processing steps through the creation of a computer program which causes a general purpose computer to complete those steps;[271]

2) Computer information processing in accordance with appropriately crafted processing instructions is highly regular and relatively error free compared with equivalent information processing by humans or human-controlled devices;[272] and

3) Computer information processing is faster than most equivalent information processing by humans or human-controlled devices.[273]

These well recognized design principles suggest that the following sequence for producing a computer update of a prior physical device or process will produce an obvious end design.[274] First, the information processing steps undertaken in the earlier physical device or process are identified and, in accordance with the first principle above, are translated into an equivalent computer processing sequence and corresponding program design. Actually, the program is not essential, just an account or "flow chart" plotting out the necessary processing steps. This tentative program design would be obvious

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271 *See, e.g.*, THOMAS C. BARTEE, DIGITAL COMPUTER FUNDAMENTALS 4-6 (6th ed. 1985).

272 *See id*. (describing the increased accuracy of computer updates of prior human-conducted information processing as one of the primary reasons for the popularity of the updates).

273 *See id*. (discussing increased computer processing speed as a typical characteristic of computer updates of prior human-conducted procedures such as a payroll accounting process).

274 *See id*. at 6 (describing the procedure for transforming a data processing task such as a payroll accounting process into an equivalent software program and computer system).

because it is a direct result of the standard programming optimization principle set out in point 1) above.[275]

Second, the processing steps determined to this point might be adjusted to take advantage of the special regularity and accuracy of computer information handling.[276] This might entail adding to or rearranging the information processing steps undertaken in the previous physical device or process, by selecting those changes that capitalize on the enhanced accuracy of computer processing. Alternatively, previous error catching steps in the physical version of the design might be eliminated in the computer update because risks of lost data, misrecorded figures, calculation mistakes, and other sources of error are of less concern in computer processing. All of these adjustments to computer-implemented information processing steps which rely on or take advantage of the general accuracy of computer-based information processing should be considered to be obvious and unpatentable additions to the computer update, since they reflect the commonly held design principle set out in 2) above.

Third, the processing steps determined and adjusted to this point might be further adjusted to optimize the functionality of the computer processing steps in light of the superior speed of computer processing.[277] Design changes that would add functionality to a computer update by increasing the number of analysis iterations or changing the ordering of analysis steps in reliance on the increased information processing speed capabilities of computers would qualify as obvious changes in light of the commonly held design principle described in 3) above.

Taken together, these notions of obvious design steps in creating computer updates provide the basis for the following proposed test to be used in identifying obvious and unpatentable computer updates of prior physical designs and processes:

Computer-based updates of prior physical devices or processes are obvious and unpatentable if:

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275 United States Patent & Trademark Office, *Formulating and Communicating Rejections Under 35 U.S.C. 103 for Applications Directed to Computer-Implemented Business Method Inventions*, *at* http://www.uspto.gov/web/menu/busmethp/busmeth103rej.htm#E10 (last visited Jan. 6, 2003) (recommending that a patent examiner should treat an invention involving the "automation of a known manual process and performed on the Internet" as obvious and unpatentable on the ground that "merely providing an automatic means to replace a manual activity which accomplishes the same result is not sufficient to distinguish [it] over the prior art").

276 *See* BARTEE, *supra* note 271, at 11 (describing the ability of computers to make precise calculations and evaluations and the consequent desirability of computer-based control systems that rely on these calculations and evaluations).

277 *Id*. at 13 (describing how the speed of computer processing can be used to alter process monitoring and control steps to implement enhanced, computer-controlled manufacturing processes).

1. Most of the information processing steps incorporated in the updates are modeled on the information processing steps undertaken in the prior physical devices or processes; and

2. The new information processing features of the updates that were not present in the prior physical counterparts are adjustments of information processing steps in the earlier devices or processes to make predictably successful use of:

   a. The regular accuracy of computer processing, or

   b. The speed of computer processing.

This standard focuses the obviousness inquiry for computer updates on the features of the updates that implement information processing steps taken from predecessor devices or processes or that rationally optimize those steps to make full use of well known computer capabilities.

C. Applying the Proposed Test: Amazon.com Revisited

To illustrate some of the implications of the proposed test, this section applies the proposed test to the invention at issue in *Amazon.com*. As previously discussed, the Court of Appeals for the Federal Circuit found that there was substantial evidence that the online shopping process at issue in *Amazon.com* was an obvious and unpatentable extension of earlier computer-based purchasing systems described in the prior art.[278] While the court identified certain similarities between several prior art designs and the system design at issue in *Amazon.com*, the court did not explain why the earlier designs would have been likely to lead an ordinary practitioner in the field of computer-based purchasing system development towards the patented design so as to make the latter an obvious extension of the prior art.

The court could have assessed the obviousness of the *Amazon.com* patent more clearly and forcefully if it had tied its analysis not to evidence of prior computer-based purchasing systems, but rather to prior purchasing systems in the physical world. The purchasing system in *Amazon.com* was based on purchasing steps that rearranged standard purchasing actions undertaken in physical supermarkets or other physical stores. These steps were translated into computer processing steps and supplemented or reorganized with further computer processing steps that improved the purchasing system by making use of special capabilities of computer-based information processing.

The obviousness of the invention in *Amazon.com* is best evaluated in terms of the invention's similarity to and conceptual roots in past physical store processes, not the invention's partial similarities to other online purchasing systems. Indeed, much of the popular criticism regarding the enforcement of the *Amazon.com* patent has revolved around notions that the process it purports to protect is highly similar to well known physical processes (such as the keeping of a bar tab or the operation of a candy vending machine), not that

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278 *See supra* text accompanying notes 132-62.

there were clear examples of similar processes present in the prior art of computer-based purchasing systems.[279]

Using the proposed test, the obviousness of the invention covered by Amazon.com's patent seems clear. The analysis of this invention would be as follows:

> The invention covered by Amazon.com's patent is obvious and unpatentable because:
>
> 1. The new design features of that invention were largely dictated by the processing steps of prior physical purchasing procedures (such as the maintenance of a bar tab or the completion of a purchase at a vending machine); and
>
> 2. The new features of the invention which were not direct counterparts to features of earlier purchasing processes (such as the retention of customer payment and delivery information and the application of that information item by item to complete purchases) represent adjustments of steps in the earlier processes to make predictably successful use of:
>
> a. The regular accuracy of computer processing (for example, in the long-term retention and repeated retrieval of customer records), or
>
> b. The speed of computer processing (for example, in the repeated application of customer record information to complete purchases item by item with a speed that did not perceptibly interrupt the purchasing experience).

In sum, this analysis views the invention at issue in *Amazon.com* as an attempt not to rationally optimize and extend prior computer-based purchasing systems, but rather to update the physical purchasing systems that were the conceptual precursors to the Amazon.com system.[280]

D. Implications of the Proposed Test

The obviousness analysis called for under the proposed standard is superior in several respects to the assessment conducted by the courts in *Amazon.com*. Because the same sorts of benefits should be realized for assessments of all types of computer updates, this section summarizes some of the advantages of the proposed analysis in the context of Amazon.com's one-click purchasing method.

First, unlike the analyses by the district court and court of appeals, the above analysis provides a clear explanation of why an average practitioner in the same design field, trying to update the same purchasing processes, would have a reason to pursue the design approach reflected in the Amazon.com purchasing system. By providing such an explanation, the proposed standard avoids the apparent arbitrariness and varying results of evaluations that turn on

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279 *See supra* text accompanying notes 112-15.

280 *See supra* text accompanying notes 103-15.

court by court assessments of the "similarity" of a patented design to designs in the prior art.[281]

Second, the logic of obviousness evaluations of computer updates under the proposed standard conforms to several elements of common knowledge about computer capabilities in the programming field. As a result, it makes these evaluations more understandable and predictable to the computer system designers whose rights and practices are governed by the evaluations. Since prevailing patent law standards specify that the obviousness of an invention is to be measured from the perspective of a practitioner having ordinary skills, obviousness assessments should apply criteria and produce results that are easily understood by most engineers in the relevant design field.

The proposed standard separately considers whether the preexisting features of physical devices or processes dictate new features of computer updates, and whether any additional new features reflect rational optimization of the updates in accordance with widely understood computer processing principles. By tying analyses to application contexts and widely held design knowledge, invention obviousness evaluations under this test will delineate patent rights boundaries that are discernable with reasonable accuracy by computer system developers. This should, in turn, enhance the incentives created by the promise of patent rights for a predictable range of nonobvious computer updates of prior physical devices and practices. The clearer definition of patent rights under the proposed standard should also lessen the likelihood that unanticipated patent rights will surprise innovators by interrupting partially completed efforts to design or implement computer updates.

Third, the above analysis suggests not only the invalidity of the particular patent at issue in *Amazon.com*, but also the invalidity on similar grounds of patents on a broad set of computer-based information processing systems in which the information processing features of earlier devices or processes have been adjusted or rearranged to maximize the use of computer processing accuracy and speed. Clarifying the obviousness and unpatentability of these types of computer updates will reassure and encourage designers seeking to rationally optimize computer implementations of earlier processes and designs that they can make full use of the speed and accuracy of computer information processing without encountering conflicting patent rights.

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281 In failing to explain why the several similarities it noted between the prior art and the claimed invention would imply the obviousness of the latter to an average practitioner, the court of appeals in *Amazon.com* fell into the trap of equating similarity with obviousness. The court of appeals gave no clear indication of why it felt the indicated similarities were enough to establish obviousness. Aside from identifying a broader range of prior art references that warranted consideration, the court of appeals also gave no explanation of how its evaluation of the similarities of the prior art to the claimed invention differed from that of the district court, which reached the opposite conclusion about the obviousness of the claimed invention. *See supra* text accompanying notes 126-71.

VII. CONCLUSION

Changing standards endorsing the patentability of new and nonobvious computer programming and business method innovations have produced a wave of new patent applications in these areas and a corresponding storm of concern over the possible issuance and enforcement of patents on obvious updates of prior business devices and processes. Concern over the patent at issue in *Amazon.com* has been particularly intense, causing some commentators to question not only the originality and patentability of the purchasing system at stake there, but indeed the ability of the patent system to properly evaluate and enforce any patents for similar business methods.[282] The result of this concern has been calls by some in the legal and computer programming fields for reversals or restrictions of the federal court rulings that have accepted a broad range of patentable subject matter in the computer programming and business method fields.[283]

This article argues that these calls for across-the-board denials of patents for innovative computer and business method systems are overreactions. It contends that the problems raised by patents such as the one at issue in *Amazon.com* can be resolved by a targeted solution in the form of a new test for the obviousness and patentability of computer updates of prior devices or processes. This type of reform is superior to restrictions on patentable subject matter in that it will retain patent incentives for some computer updates that involve new and unexpectedly successful types of information processing methods or functional results.

Leaving these incentives in place for nonobvious computer updates of devices, processes, and business methods ensures that the development of these updates will benefit from the types of patent incentives that have enhanced other innovative projects. At the same time, treating the field of computer update design on a par with other engineering domains for patent law purposes avoids the need for courts and other analysts to draw difficult lines between the computer update field and other engineering domains for purposes of applying particularly restrictive patentable subject matter tests only to computer update advances.

However, even if normal tests for patentable subject matter are applied to computer updates of earlier devices and processes, only some of these updates deserve patent incentives and rewards. Computer updates that would be likely to arise through widely understood design optimization methods or workmanship improvements will generally be developed and brought to public attention without patent incentives. These types of computer updates should remain free of patent restrictions. Other computer update advances that would not be predictably successful to practitioners applying widely understood

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282 *See, e.g.*, Raskind, *supra* note 17, at 64 (discussing business method claims, and stating that "the current boom in such claims suggests the need for caution and restraint on the part of both the PTO and courts.").

283 *Id. See also* Dreyfuss, *supra* note 17, at 267 (questioning the use of patent law as a way to encourage the production of new business methods).

principles for optimizing past device and process designs are less likely to be produced spontaneously and need the extra encouragement of patent rewards.

The standard proposed in this article for obviousness evaluations of computer updates relies on widely understood programming principles to separate computer updates which merit patent incentives from those which are likely to come to public attention and produce public benefits without those incentives. The proposed standard conforms obviousness evaluations to the logical steps used in computer update design development, with the result that practitioners in this field of design should be able to rely on their own design expertise to at least roughly predict when patentable designs are present and potential rewards or restrictions concerning those designs will apply.

Overall, the proposed standard specifies that computer updates are obvious and unpatentable if the updates do no more than implement information processing steps previously present in physical devices or processes or add further steps to rationally optimize the information processing of such earlier devices or processes by capitalizing on the information processing speed and accuracy of computers. Computer system designers who go beyond these steps and create systems that incorporate unpredictably successful means of computer processing or that produce unpredictably successful results will still be encouraged by patent rights to develop, disclose, and popularize these unusual, nonobvious systems.

By retaining and clarifying this dividing line between free development and patent incentives, the proposed standard increases public benefits from free competition among average practitioners who produce computer updates by rationally optimizing and extending prior physical devices and systems, while still retaining patent incentives for occasional nonobvious redesigns of such devices and systems based on extraordinary insights. Both of these two types of computer updates – routine optimizations and revolutionary redesigns – are important to the public. An appropriately crafted nonobviousness standard helps to ensure that the right mix of free competition and patent incentives is used to encourage the creation of both these types of valuable computer updates to physical devices and processes.

In short, in the flexible world of computer updates, every old device or process can be new again and provide new public service provided that we tailor patent law standards to create the right mix of freedom and incentives to encourage both the evolutionary and revolutionary computer update.