No. 13-298

IN THE

Supreme Court of the United States

ALICE CORPORATION PTY. LTD.,

Petitioner,

v.

CLS BANK INTERNATIONAL AND
CLS SERVICES LTD.,

Respondents.

ON WRIT OF CERTIORARI TO THE UNITED SATES
COURT OF APPEALS FOR THE FEDERAL CIRCUIT

BRIEF OF *AMICUS CURIAE* INTELLECTUAL PROPERTY OWNERS ASSOCIATION IN SUPPORT OF NEITHER PARTY

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STATEMENT OF INTEREST OF *AMICUS CURIAE*

The Intellectual Property Owners Association (IPO) is a trade association representing companies and individuals in all industries and fields of technology who own or are interested in intellectual property rights.[1] IPO's membership includes more than 200 companies and over 12,000 individuals who are involved in the association either through their companies or as inventor, author, executive, law firm, or attorney members. Founded in 1972, IPO represents the interests of all owners of intellectual property. IPO regularly represents the interests of its members before Congress and the USPTO and has filed amicus curiae briefs in this Court and other courts on significant issues of intellectual property law. This brief was approved by the IPO Board of Directors. A list of IPO board members can be found in the Appendix.[2]

INTRODUCTION

This case raises fundamental issues concerning the patent eligibility of computer-implemented inventions under Section 101 of the Patent Act. The issue before the Court in this case is:

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1. No counsel for a party authored this brief in whole or in part, and no such counsel or party made a monetary contribution intended to fund the preparation or submission of this brief. No person other than the *amicus curiae* or its counsel made a monetary contribution to its preparation or submission. Both parties consented to the filing of amicus briefs through blanket consent letters filed on December 11, 2013.

2. IPO procedures require approval of positions in briefs by a two-thirds majority of directors present and voting.

> Whether claims to computer-implemented inventions – including claims to systems and machines, processes, and items of manufacture – are directed to patent-eligible subject matter within the meaning of 35 U.S.C. § 101 as interpreted by this Court?

Without taking any position on the particular facts of this case, IPO welcomes the opportunity to respond to this question. In doing so, IPO is not advocating any particular result with respect to the dispute in this case. However, IPO will endeavor to synthesize the holdings of this Court in a series of cases dating back to the Nineteenth Century and culminating in the recent decision in *Mayo Collaborative Servs. v. Prometheus Labs., Inc.,* 132 S. Ct. 1289 (2012), to derive a set of principles and rules that will enable patent practitioners, the U.S. Patent and Trademark Office and the courts to consistently and predictably determine the patent eligibility of computer-implemented inventions.

SUMMARY OF ARGUMENT

The issue of patent eligibility of computer-implemented inventions is crucially important to IPO members and the broader U.S. economy. Nearly every sector of today's economy depends on innovations in computer-implemented technologies to improve products and services, increase productivity and efficiency, and strengthen competitiveness. As courts assess the patentability of computer-implemented inventions they should take care not to erect barriers to the patentability of new and useful technological advances that would threaten these benefits. Nor should courts impose a higher standard of patentability for computer-implemented inventions than is routinely applied to innovations in other fields of technology.

In recent years, both this Court and lower courts have issued a number of rulings which seek to draw the line between patent ineligible abstract ideas and patent eligible implementations of such ideas. In attempting to provide further clarity, this Court should take care not to apply overly formalistic rules or tests whose application to computer-implemented inventions might exclude significant new and useful inventions from patentability or encourage innovation in claim drafting rather than technology. IPO urges this Court to recognize several fundamental and longstanding principles that the U.S. Patent and Trademark Office and the courts can apply in determining whether a computer-implemented invention is patentable. In so doing, the Court should recognize that all inventions, to some extent, rely on the basic laws of nature and abstract ideas, and that any invention that applies such laws and ideas to achieve a new and useful end is potentially eligible for patent protection. *See, e.g.*, *Funk Bros. Seed Co. v. Kalo Inoculant Co.*, 333 U.S. 127, 130 (1948).

In the context of computer-implemented inventions, as the question presented indicates, it is often possible to claim what is essentially the same invention as a computer-implemented "method," a "system," or a "storage medium" containing data and/or computer instructions. Generally, with respect to patent eligibility, it should not matter in such inventions which of those claim forms have been chosen by the patent drafter, as selecting one form would inappropriately elevate form over substance. However, it is also true that, in many instances, the use of a particular claim form can be significant in defining the nature or scope of the invention. Thus, the fact that the same subject matter can sometimes be claimed using different claim forms does not justify ignoring explicit claim limitations when conducting a Section 101 analysis. Rather, the claim as a whole, and all limitations, should be assessed. *See Diamond v. Diehr*, 450 U.S. 175, 188 (1981).

Applying these principles to computer-implemented innovations, the existing precedent suggests two fundamental considerations that the courts should apply in determining whether a particular computer-implemented claim is directed to a new and useful application of an idea as opposed to the idea itself: (1) the computer implementation must be claimed with sufficient particularity and specificity to ensure that meaningful limits on the scope of the claims are imposed; and (2) the computer implementation and corresponding claim elements must be a significant contributor to achieving the intended result and do more than simply describe the normal, conventional method to apply the idea.

ARGUMENT

I. COMPUTER-IMPLEMENTED INVENTIONS, PROPERLY CLAIMED, ARE PATENT-ELIGIBLE SUBJECT MATTER UNDER THIS COURT'S PRECEDENT DATING BACK TO THE NINETEENTH CENTURY

The Constitution empowers Congress to "promote the Progress of Science and the Useful Arts…." U.S. Const. Art. 1, § 8. Congress has implemented this grant in Section 101 of the Patent Statute by identifying certain subject matter, the invention or discovery of which may merit a patent: "Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefore, subject to the conditions and requirements of this title." 35 U.S.C. § 101. The terms employed in Section 101 have been used for over 200 years – since the beginning of the American patent system – to define the scope of patent eligible subject matter. Section 101's description of patent eligible subject matter is broad, intended by Congress to "include anything under the sun that is made by man." S. Rep. No. 82-1979 (1952), *reprinted in* 1952 U.S.C.C.A.N. 2394, 2399. But it is also unquestionably not without boundaries. Most fundamentally, patent eligible subject matter cannot include "laws of nature, physical phenomena, and abstract ideas." As early as *Le Roy v. Tatham*, 55 U.S. 156 (1852), this Court explained that "[a] principle, in the abstract, is a fundamental truth; an original cause; a motive; these cannot be patented, as no one can claim in either of them an exclusive right." *Id*. at 175. Since then, the principle that abstract ideas are unpatentable has repeatedly been confirmed.

Although the principle is longstanding, its application to specific patent claims has been challenging. As the multitude of opinions in this case below by the Court of Appeals for the Federal Circuit clearly indicates, let alone the numerous other lower court decisions struggling with Section 101, there has been a complete failure to bring any measure of consistency and predictability to the abstract idea inquiry. S*ee* Donald S. Chisum, *Weeds and Seeds in the Supreme Court's Business Method Patents Decision:*

New Directions for Regulating Patent Scope, 15 Lewis & Clark L. Rev. 11, 14 (2011) ("[The] Section 101 abstract idea preemption inquiry can lead to subjectively-derived, arbitrary and unpredictable results. This uncertainty does substantial harm to the effective operation of the patent system.").

A. A Practical and Useful Application of an Abstract Idea or Law of Nature is Patentable

As discussed below, there are a number of analytic tools, each derived from case law, which courts should look to in assessing patent eligibility. Key among these is the distinction between the underlying idea and a particular method or device for implementing it to accomplish a useful result. For example, in *Tilghman v. Proctor*, decided in 1880, this Court articulated the dividing line between eligible and ineligible subject matter as follows:

> [The] claim of the patent is not for a mere principle. The chemical principle or scientific fact upon which it is founded . . . was not discovered by Tilghman. He only claims to have invented *a particular mode* of bringing about the desired chemical union between the fatty elements and water.

102 U.S. 707, 729 (1880) (emphasis added). The Court drew the same distinction in its 1939 decision in *Mackay Radio & Telegraph Co. v. Radio Corp. of America,* noting:

> While a scientific truth, or the mathematical expression of it, is not a patentable invention, a novel and useful structure created with the aid of knowledge of scientific truth may be.

306 U.S. 86, 94 (1939). And again in *Funk Bros. Seed Co. v. Kalo Inoculant Co.*, the Court decided in 1948:

> He who discovers a hitherto unknown phenomenon of nature has no claim to a monopoly of it which the law recognizes. If there is to be invention from such a discovery, it must come from *the application of the law of nature to a new and useful end.*

333 U.S. 127, 130 (emphasis added).

In fact, this distinction is so well established in the precedents that this Court has stated that "[i]t is now commonplace that an application of a law of nature or mathematical formula to a known structure or process may well be deserving of patent protection." *Diehr*, 450 U.S. at 187 (citations omitted).

This same dichotomy was addressed again by this Court in its recent decision on patent eligibility, in which the Court distinguished between ineligible claims to a law of nature itself and patent eligible processes that *apply* natural laws. As explained by the Court:

> The question before us is whether the claims do significantly more than simply describe [the law of nature]. To put the matter more precisely, do the patent claims add *enough* to their statements of the [law of nature] to allow the processes they describe to qualify as patent eligible processes that *apply* natural laws?

Mayo Collaborative Servs. v. Prometheus Labs., Inc., 132 S. Ct. 1289, 1297 (2012) (emphasis in original).

B. The Same Principles Should be Applied to Computer-Implemented Inventions as Apply to Other Inventions Implemented by Machines

When one recognizes that a computer is nothing but a machine that is capable of being configured, either through hardware or software, to perform a wide variety of tasks, it becomes clear that the fundamental issues presented in this case are not significantly different from those arising in some of the earliest cases relating to the use of machines to perform tasks more efficiently than they could be performed by humans. In fact, as early as 1864, the Supreme Court upheld Samuel Morse's claim for a "system of signs, consisting of dots and spaces, and of dots, spaces and horizontal lines" for manipulating a telegraph key in such a way as to produce a useful communication between two parties. *See O'Reilly v. Morse*, 56 U.S. 62, 86 (1853). As an example of one of the earliest electronic communication protocols, Morse's valid claim is not substantively different from many of the software implemented processes claimed by computer innovators in the Information Age.

These early cases also make it clear that a patent claiming the use of a machine to perform a new and useful task does not necessarily require that the machine itself be novel or specifically designed for that purpose. *See Cochrane v. Deener,* 94 U.S. 780, 788 (1876) ("The machinery pointed out as suitable to perform the process may or may not be new or patentable; whilst the process itself may be altogether new, and produce an entirely new result."). Indeed, section 100(b) of the Patent Act specifically defines the term patentable "process" to include "a *new use of a known* process, machine, manufacture, composition of matter, or material." 35 U.S.C § 100(b) (emphasis added).

Nothing in Section 101 suggests that an otherwise eligible "process, machine, manufacture, or composition of matter, or any new and useful improvement thereof" somehow becomes patent-ineligible simply because its implementation requires the use of a computer. A clear illustration of this principle is provided by *Diamond v. Diehr*. In *Diehr*, a previously unknown method for "molding raw, uncured synthetic rubber into cured precision products" that included a computer program was patentable because the industrial process underlying the invention was otherwise patentable. 450 U.S. at 177. As the Court held, "a claim drawn to subject matter otherwise statutory does not become nonstatutory simply because it uses a . . . computer program, or digital computer." *Id.* at 187.

II. PATENT CLAIMS MUST BE CONSIDERED AS A WHOLE

Despite the ongoing challenges with Section 101, it is clear that "a process is not ineligible simply because it contains a law of nature or a mathematical algorithm." *Diehr*, 450 U.S. at 187 (internal quotation marks omitted). Instead, this Court has repeatedly indicated that an evaluation of the patentability of a computer-implemented claim must focus on the substance of the claim as a whole. As the Court stated in *Diehr:*

> It is inappropriate to dissect the claims into old and new elements and then to ignore the presence of the old elements in the analysis. This is particularly true in a process claim because a new combination of steps in a process may be patentable even though all the constituents of the combination were well known and in common use before the combination was made. The "novelty" of any element or steps in a process, or even of the process itself, is of no relevance in determining whether the subject matter of a claim falls within the § 101 categories of possibly patentable subject matter.

Diehr, 450 U.S. at 188; *see also Bilski v. Kappos,* 130 S. Ct. 3218, 3230 (2010); *Prometheus*, 132 S. Ct. at 1303-04.

It is not uncommon for persons drafting claims for computer-implemented inventions to define the invention in terms of the method steps performed by the computer, the system that implements those steps or the media on which the instructions and data necessary to implement the steps are stored. In such cases, there is no sound basis for treating these equivalent claims differently in assessing eligibility and to do so would inappropriately elevate form over substance. Interpretations of Section 101 that "depend simply on the draftsman's art" are unworkable and do not effectuate the goal of sorting out inventions in computing or other fields from abstract ideas that merely invoke computer terminology in an incidental manner. *See Parker v. Flook*, 437 U.S. 584, 593 (1978).

This does not mean, however, that differences in claim language and claiming practice will always be irrelevant or inconsequential when determining the scope of the claimed subject matter. It is entirely probable that each of those aspects of a computerized process: the steps performed, the physical configuration of the system and the nature and location of the storage media, may have a separate and independent significance to the claimed implementation and it would be wholly improper to ignore them. In assessing patent eligibility, as in other forms of validity, one must consider not only those elements that are "novel" or "inventive," but whether all of the elements combined constitute a patentable invention.

Accordingly, while the claim form is not dispositive in determining eligibility, this does not relieve courts of their obligation to carefully construe claim language or to consider the claim as a whole in determining whether it is directed to statutory subject matter. In particular, courts should take into account all limitations included by the applicant and should avoid basing the determination of eligibility on a dissection of claim elements or on the court's subjective view of the "essence" or "heart" of the invention. Ultimately, it is the language of the claims alone that defines the invention. *See Cont'l Paper Bag Co. v. E. Paper Bag Co.*, 210 U.S. 405, 419 (1908) ("the claims measure the invention"); *Aro Mfg. Co. v. Convertible Top Replacement Co.*, 365 U.S. 336, 345 (1961) ("There is no legally recognizable or protected 'essential' element, 'gist' or 'heart' of the invention in a combination patent.").

In sum, claims that are in fact directed to the same subject matter, regardless of claim form, should generally be treated the same in assessing patent eligibility under

Section 101. But courts must be careful to consider the entire claim and may not ignore substantive differences between claims when analyzing the claimed subject matter for purposes of the eligibility analysis.

III. A CLAIM FOR A COMPUTER-IMPLEMENTED INVENTION INVOLVING AN ABSTRACT IDEA IS PATENT ELIGIBLE IF IT DESCRIBES A SPECIFIC, PRACTICAL APPLICATION OF THE IDEA

Although there is seemingly little controversy as to the patentability of advances in computer technology itself, the use of computers to implement ideas that would otherwise be deemed patent ineligible abstract ideas raises an additional issue: what is required to convert a claim from one that merely states an abstract idea to one that provides a new and useful application of that idea? As the Court stated in *Prometheus*, "to transform an unpatentable law of nature into a patent eligible application of such a law, one must do more than simply state the law of nature while adding the words 'apply it.'" *Prometheus,* 132 S. Ct. at 1294. However, the cases also make it clear that a computer-implemented invention will not be deemed a mere abstract idea if the computer implementation is claimed with sufficient particularity and specificity to ensure that meaningful limits on the scope of the claims are imposed.

The need for specificity can be traced to the Court's seminal and oft quoted decision in *O'Reilly v. Morse,* in which the Court held ineligible Morse's claim to the use of "electro magnetism, however developed for marking or printing intelligible characters, signs, or letters, at any distances," and stating further:

> If this claim can be maintained, it matters not by what process or machinery the result is accomplished. For aught that we now know, some future inventor, in the onward march of science, may discover a mode of writing or printing at a distance by means of the electric or galvanic current, without using any part of the process or combination set forth in the plaintiff's specification. His invention may be less complicated — less liable to get out of order — less expensive in construction, and in its operation. But yet, if it is covered by this patent, the inventor could not use it, nor the public have the benefit of it, without the permission of this patentee.

56 U.S. 62, 112; *see also Prometheus*, 132 S. Ct. at 1294 ("[U]pholding the patents would risk disproportionately tying up the use of the underlying [abstract ideas or] natural laws, inhibiting their use in the making of further discoveries."); *Bilski*, 130 S. Ct. at 3231 ("Allowing petitioners to patent risk hedging would preempt use of this approach in all fields, and would effectively grant a monopoly over an abstract idea.").

In its recent decision in *Prometheus,* this Court also made it clear that, in order to be effective in distinguishing a practical implementation from an abstract idea, the additional limitations must also be significant, and not merely "a drafting effort" that adds nothing of substance to the abstract idea itself. Thus, in that case, the Court held that claim limitations describing standard testing procedures that were so conventional and ordinary, both by themselves and in combination, that they contributed nothing of significance to the invention, were insufficient to render the claims eligible for a patent.

> These instructions add nothing specific to the laws of nature other than what is well-understood, routine, conventional activity, previously engaged in by those in the field. And since they are steps that must be taken in order to apply the laws in question, the effect is simply to tell doctors to apply the law somehow when treating their patients.

Prometheus, 132 S. Ct. at 1299-1300.[3]

In the context of evaluating patent eligibility, attention is often placed on a so-called "preemption analysis," including the Federal Circuit's plurality opinion in the case below. *See CLS Bank Int'l v. Alice Corp. Pty. Ltd.*, 717 F.3d 1269, 1280-83 (Fed. Cir. 2013) (Lourie, J). While a preemption analysis can be a consideration in determining patent eligibility, it should not be the primary focus, since over-reliance on such analysis can lead to the type of piecemeal, subjective interpretation of patent claims that this Court has recognized as improper. As noted above,

3. Importantly, this Court's decision to disregard "conventional" techniques is fundamentally different from the application of Sections 102 and 103 of the Patent Act to reject claims that have been previously disclosed or obvious from all of the prior art that was in existence at the time of the filing. Rather, the examples provided by the Court suggest that these limitations are insufficient because they constitute either a necessary step in *any* application of the law of nature or are so ordinary and well-known as to amount to only a pretextual or trivial limitation on the effective scope of the claim.

in analyzing whether computer-related limitations render otherwise abstract claims patent eligible, courts should take care to read the claim in its entirety. *Any* computer-related limitation can be distilled into a series of seemingly "old" or "conventional" steps, such as performance of arithmetic calculations, storing data, transmitting data, etc. Piecemeal interpretation of claims is improper because it can trivialize any computer implementation of an abstract idea, no matter how detailed or specific the implementation. Even if its individual components may seem ordinary, the combination, sequence and details of a computer based implementation of an idea may nevertheless be sufficiently significant to render it patent eligible. *See Diehr*, 450 U.S. at 188.

IV. COMPUTER-IMPLEMENTED INVENTIONS ARE PERVASIVE AND ESSENTIAL IN THE MODERN ECONOMY, SO IPO URGES CAUTION AGAINST UPSETTING DECADES OF SETTLED EXPECTATIONS REGARDING THEIR LEGAL PROTECTION VIA PATENT RIGHTS

Clearly, over the past half century, computer-implemented inventions have become vastly important to technological advancement. Because much of today's scientific progress necessarily involves computers, courts should tread carefully in devising categorical rules that might preclude legitimate advances in the computer arts from being patentable. These advances involve not only physical computer hardware, but also the software that turns general purpose hardware into useful machines. Many of the functions historically performed by mechanical assemblies and virtually all of the functionality of hard-wired electronic circuitry can be performed today through programmable devices. Most modern telephones, radios and other electronic devices are essentially computers with embedded but modifiable programs installed in non-volatile memory.

In order to fully appreciate the critical necessity of patent eligibility for computer-implemented inventions as guided by this Court's precedent, it is useful to have a general understanding of computing technology, including the interrelationship between computing hardware and software. At a high level, computers work when software is activated to control hardware components to carry out computerized actions. Thus, software animates hardware to cause a computer to perform useful actions. A computer consists of both hardware and software, but hardware and software are interdependent upon one another to carry out real-world, physical tasks. "The hardware of a computer is useless unless appropriate software is available to perform different tasks. Similarly software cannot run without hardware. Therefore software and hardware are completely interdependent on each other." Deepali A. Godse, *Computer Programming* 1-7 (Technical Publications 2007). The real-world impact of software is evident from any software upgrade process. "When additional software is made available on a computer system, the functionality of the system is enhanced. Thus even while the hardware components of a system remain unchanged, its usefulness is increased by the newly added software." Naresh D. Jotwani, *Computer System Organization* 311 (McGraw-Hill Educ. 2009).

Broadly speaking, computers may be divided into embedded computers and conventional computers. A "conventional computer" generally refers to a server, desktop, or laptop computer, mobile devices such as tablets and smartphones, or other computing devices. By contrast, embedded computers are often concealed inside a device and are frequently overlooked. One designer notes "[e]mbedded computers are far more numerous than desktop systems, but far less obvious. In fact, [the average person] has more than 30 or more [embedded computers], hidden inside TV's, VCR's, DVD players, remote controls, washing machines, cell phones, air conditioners, game consoles, ovens, toys, and a host of other devices." John Catsoulis, *Designing Embedded Hardware* 1 (2nd ed., O'Reilly 2005). In modern times we are literally surrounded by both conventional and embedded computers, though we are often unaware that software is also running on our many embedded computers.

Whether running an embedded computer or a conventional computer, software has a real, tangible existence, and precisely defined operation. At the lowest information level, a computer program consists of an organized sequence of binary ("on" or "off") values usually represented as a "1" or "0," respectively, over some segment of storage. And this information is organized into "instructions" that have well-defined process operations associated with corresponding computer hardware. *See* David A. Patterson & John L. Hennessy, *Computer Organization and Design* 6 (2nd ed. 1998). The physical manifestation of binary information within a computer varies according to storage technology. In a magnetic disk, binary information is stored by orienting a magnetic field within a portion of a magnetic film in the disk relative to a directional reference. *See* Ron White, *How Computers Work* 159 (9th ed. 2008). Within Random Access Memory (RAM) a charge associated with a transistor stores a "1."

Within flash memory a "1" is stored as a difference in charge between two transistors. *Id.* at 61. Regardless of the storage technology, instructions control the operation of semiconductor hardware. Instructions perform operations within computer hardware such as arithmetic operations, logical operations, branch operations, etc. Through the sequential operation of such instructions, software controls other devices such as printers, displays, communication ports, networks, modems, speakers, etc. (in the conventional computer context).

The execution of a typical program illustrates that software implemented processes perform rapid activation and deactivation of transistors. A computer typically has: memory that stores an instruction sequence forming a program, a register file that stores intermediate results, a control block, a datapath element, an input interface and an output interface. *See* Patterson & Hennessy, *supra*, at 16. All of these elements are built from transistors that are either activated or deactivated under the control of software. *See, e.g., id.* at 14-15, 23, 31, and 106. Execution of a program begins when the computer is told to begin executing a sequence of instructions beginning with the first instruction of a program. *Id.* at 122. Each instruction operates on the information stored within the transistor elements to fetch operands from memory, to combine operands through arithmetic or logical operations, and to store a result. A software program in a modern computer can perform at least hundreds of millions of such operations per second. *See* Paul Vanezia, *Chip Wars, Intel Strikes Back,* 26 Info World 40 (Aug. 2, 2004). Thus, the execution of software processes activates and deactivates millions of transistors in the course of performing useful functions for the computer user.

At the core of the computer hardware is the processor that consists of a control unit and a datapath element. *See* Patterson & Hennessy, *supra*, at 14. A hardware processor supports multiple instruction types, such as multiply, add, load, store, branch, etc. For each instruction type the processor looks at the content of the software instructions to decode the instruction type, and on this basis rewires pathways between memory, the register file, control and the data pathway hardware elements to carry out the instructions. This rewiring is effected by state changes of the transistors that implement the control and datapath elements. *Id.* at 339-343. In essence, software instructions literally, but temporarily, reconfigure electronic pathways between transistors and transform the computing hardware with tangible information that defines precise operations to perform real, useful, and physical activity.

Not only are software and hardware components interdependent, but in many cases they are interchangeable, as many computing functions can be implemented by hardware components, software components, or a combination of hardware and software components. An algorithm that is implemented in a computer through the use of software can be replaced by a special-purpose hardware component that performs the same function but does not directly use software. Likewise, a portion of hardware can often be eliminated from a computer system, and the function of that portion can be performed instead by the computer using software. Computer system developers understand that "you can think of the algorithm as a combination of hardware components and software components…[y]ou can implement that algorithm purely in software…purely in hardware…or in some combination of the two." Arnold S. Berger, *Embedded Systems Design:*

An Introduction to Processes, Tools and Techniques 8 (CRC Press 2001). Of course, as stated earlier, when an algorithm is implemented "purely in software," it does not perform the algorithm without any hardware, but necessarily controls hardware components to carry out computerized actions.

Indeed, software has been described as "the new physical infrastructure of the information age" and should be accorded commensurate protection in the patent system. *Report to the President, "Information Technology Research: Investing in Our Future,"* President's Information Tech. Advisory Comm. (PITAC), Nat'l Coordination Office for Computing, Info. & Comms. (1999). The U.S. Department of Commerce approximates U.S firms invested $126.3 billion of R&D into the U.S. Software and IT Services Industry in 2011. *See The U.S. Software and IT Services Industry,* U.S. Dep't of Commerce, available from: http://selectusa.commerce.gov/industry-snapshots/software-and-information-technology-services-industry-united-states (last visited Jan. 13, 2014). The $126.3 billion invested by U.S. companies represents a significant amount of private outlay.[4] For decades computer-implemented innovations have served as a major catalyst for U.S. economic growth and vitality. *See, e.g.,* Dale W. Jorgenson, Mun S. Ho, and Kevin J. Stiroh, *Productivity Volume 3: Information*

4. A study by the National Science Foundation found overall U.S. spending on research and development totaled $428 billion in 2011 and approximately $294.1 billion was the result of private businesses. *See* Mark Boroush, *U.S. R&D Resumes Growth in 2011 and 2012, Ahead of Pace of the Gross Domestic Product*, InfoBrief (Nat'l Center for Sci. and Eng'g, Dec. 2013) at 1, *available at*: www.nsf.gov/statistics/infbrief/nsf14307/nsf14307.pdf.

Technology and the American Growth Resurgence, Cambridge: MIT Press (2005), at 9-14.

The speed with which computer and software technologies have changed the world is both profound, and deeply realized, such that nearly every aspect of our society is touched by these discoveries. The growing importance of software has led those knowledgeable on the subject to conclude that software is "the single biggest driver of productivity growth." William J. Raduchel, *The Economics of Software, in Measuring and Sustaining the New Economy Software, Growth, and the Future of the U.S. Economy: Report of a Symposium*, at 37-38 (Dale W. Jorgenson et al. eds., National Academic Press, 2006), available from: http://nap.edu/catalog/11587.html. In short, computer-implemented inventions play a significant role in the U.S. economy.

The far-reaching impact of computer-implemented innovations is evidenced by the wide scope of applications in practically all sectors of the economy, and the deeply pervasive way our society is influenced by these innovations – from the routine, such as receiving newspapers – to the profound, such as literally saving lives. Utilizing eICU technology that combines software, video feed, and real-time patient information, specialists at Sentara Norfolk General Hospital in Norfolk, VA, are able to cover eleven ICUs at six hospitals, spread sixty miles apart, around the clock.[5] *See* Timothy J. Mullaney,

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5. The eICU technology enabled doctors at two hospitals in the Sentara system to reduce deaths by 27 percent in the first year, reduce costs per ICU case by about 25 percent, and cut nearly an entire day off of the average patient's ICU stay from 4.4 to 3.6 days. *Id.*

The Doctor Is (Plugged) In, BusinessWeek.com (Jun. 25, 2006), available from: www.businessweek.com/magazine/content/06_26/b3990076.htm.

Greater investment in computer-implemented technologies is associated with greater productivity and growth for individual businesses and the country. In fact, numerous scholarly studies since the mid-1990s have found "positive and significant effects" of hardware, software, applications and telecommunications on productivity. *See* Robert D. Atkinson & Andrew S. McKay, *Digital Prosperity: Understanding the Economic Benefits of the Information Technology Revolution,* 10 Info. Tech. & Innovation Found., at 14 (2007) (quoting Jason Dedrick, ViJay Gurbaxani, and Kenneth L. Kraemer, *Information Technology and Economic Performance: A Critical Review of the Empirical Evidence*, ACM Computing Surveys 35.1 (Mar. 2003), at 12).

Computer-implemented technologies have made it easy and efficient for individuals with responsibilities to care for dependents (either children or aged parents) to work part-time from the home, particularly because "[c]omputers, software, video displays, and digital switching technologies make it possible for the home to be as connected as to work as an office." *Id.* at 35. Even in leisure activities, computer-implemented inventions are at the heart of various advances from more efficient gas-electric hybrid cars to receiving the newspaper. Notably, compared to reading a newspaper, receiving the news on a wireless mobile device results in the release of 32 to 140 times less CO^2, and several orders of magnitude less NOx and SOx. *See* Michael W. Toffel and Arpad Horvath, *Environmental Implications of Wireless Technologies:*

News Delivery and Business Meetings, 38 Environmental Science & Technology 2961, 2964 (July, 2004) (measuring effects based on AvantGo and EIO-LCA software).

Innovation and investment in IT-utilizing industries was the main source of sustained U.S. productivity growth from 2000-2007. *See* Dale W. Jorgenson, Mun Ho, and Jon Samuels, *Information Technology and U.S. Productivity Growth: Evidence from a Prototype Industry Production Account*, at 18 (Nov. 19, 2010), *available at*: https://scholar.harvard.edu/files/jorgenson/files/02_jorgenson_ho_samuels19nov20101_2.pdf. Notably, computer-implemented innovations are not owned only by software companies. In fact, "[t]he majority of the software patents acquired during the past twenty years have been acquired by non-software firms in the information and communication technology sector," and the firms that acquired these patents "had a slightly higher market value than those with no software patents." Bronwyn H. Hall and Megan MacGarvie, *The Private Value of Software Patents*, Research Policy Paper, at 53-54 (2009), *available at*: http://elsa.berkeley.edu/~bhhall/papers/HallMacGarvie_Dec09.pdf. Indeed, computer-implemented innovations have leveled the research and development playing field between large and small companies and dramatically increased competitiveness "[b]ecause small and mid-sized firms can now better compete in product markets, they have dramatically increased their R&D investments." Robert M. Hunt & Leonard I. Nakamura, *The Democratization of U.S. Research and Development after 1980*, Society for Economic Dynamics, Meeting Paper 121 (2006) (noting also that while the R&D to GDP ratio more than doubled between 1980 and 2000, almost all of the increase was because small and mid-sized firms with fewer than 5,000 employees increased their R&D investments). Software applications, particularly, extend to all aspects of the economy, including internal operations of organizations (business, government, and non-profit), transactions between organizations, and transactions between individuals. *See* Robert Atkinson, *Digital Prosperity* at 7 (explaining the development of computers and software incorporating graphical user interfaces made it possible for non-highly-trained people to exploit the benefits of information technology).

Clearly, American life is characterized at all stages by interactions with technology. As such, the pervasiveness of computer-implemented innovations form an essential part of the cross disciplinary impetus for most innovators. For example, the development of new software often requires collaboration between those who are experts in computer languages, those who are knowledgeable about the human-computer interface, and those with domain expertise in the areas of software application. *See* Fred Block & Matthew R. Keller, *Where do Innovations Come From? Transformations in the U.S. National Innovation System, 1970-2006,* The Information Technology & Innovation Foundation, July 2008.

Affording patent protection to computer software innovations advances the goals of the Patent Act. "[B]oth economic theory and practical experience suggest that the availability of patents for software promotes innovation by supplying (additional) incentives to inventors." Julie E. Cohen and Mark A. Lemley, *Patent Scope and Innovation in the Software Industry*, 89 Cal. L. Rev. 1, 5 (2001); *see also* Bradford L. Smith and Susan O. Mann, *Innovation and Intellectual Property Protection in the Software*

Industry: An Emerging Role for Patents, 71 U. Chi. L. Rev. 241, 244 (2004) ("[P]atent protection for software provides a desirable form of protection for many forms of software innovation and may offer a more effective mechanism than either copyright or trade secret law for balancing incentives for innovation against the goals of interoperability and transparency.")

The economic case for computer-implemented innovations underscores that "the integration of IT into virtually all aspects of the economy and society [has] creat[ed] a digitally-enabled economy that is responsible for generating the lion's share of economic growth and prosperity." *See* Robert Atkinson, *Digital Prosperity* at 3. Dramatically reshaping the widespread expectations and reliance on patents for computer-implemented technologies would cause massive uncertainty in what is nearly a half-trillion dollar (annually) thriving market for innovation despite recent economic challenges. As four members of this Court cautioned in explaining their rejection of the machine-or-transformation test as the sole test for patent eligibility, courts must take care to avoid undermining the intended incentives of patent protection for computer-related inventions and other new technologies:

> The machine-or-transformation test may well provide a sufficient basis for evaluating processes similar to those in the Industrial Age – for example, inventions grounded in a physical or other tangible form. But there are reasons to doubt whether the test should be the sole criterion for determining the patentability of inventions in the Information

> Age. As numerous amicus briefs argue, the machine-or-transformation test would create uncertainty as to the patentability of software, advanced diagnostic medicine techniques, and inventions based on linear programming, data compression, and the manipulation of digital signals.

Bilski 130 S. Ct. 3218, 3227 (internal citations to *amicus* briefs omitted).

Thus, it has been well established from the earliest days of patent jurisprudence that a method or system that permits or enables a machine to perform a new and useful task is eligible for patent protection, and this principle applies to computers and computer-implemented inventions at least to the same extent as any other man-made devices.

CONCLUSION

Over the last 50 years, computers and other programmable devices have become the principal means to perform the type of functions that have historically been performed by many mechanical devices or hard-wired circuitry, and it is critical to preserve patent protection for inventors who create ways to harness the capabilities of computers to perform new and useful functions. Computer-implemented inventions, like all technological advances, rely to some extent on fundamental laws of nature and abstract principles. Relying on fundamental laws of nature and abstract principles have never been, and should not become, a barrier to patentability. So long as an invention claims a specific and practical application of computer technology to accomplish a new and useful goal, and complies with the fundamental requirements imposed by the courts on all inventions, it should be eligible for patent protection under Section 101 of the Patent Act.

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APPENDIX

APPENDIX[1]

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