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The trends and current practices in the area of patentability of computer implemented inventions within the EU and the U.S.

FINAL REPORT

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Digital Single Market

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Abstract

This report initially examines the rules for subject-matter eligibility of computer-implemented (CI) inventions under the laws applied by the European Patent Office ("EPO") and in the U.S. These rules impose material constraints on the CI inventions that are patentable in these jurisdictions. There do not appear to have been significant changes to the EPO criteria over the last few years; by contrast the interpretation and application of the U.S. criteria have significantly changed during this period.

The changes in the U.S. criteria have led to a threshold for patentability of CI inventions that is more similar to that of the EPO's, especially compared to the situation in 2005 when the European Parliament rejected a draft directive relating to CI inventions. Patent quality, however, remains a concern in both jurisdictions. Patent troll activity in the U.S. has increased dramatically, although recent legislative changes may temper this. Although patent troll activity is not yet a large concern in European jurisdictions, the establishment of a Europe-wide court system for patent litigations through the Unified Patent Court may change this.

Additionally, this report summarizes an empirical study of cloud-computing patents that have been asserted in litigation. Using these asserted patents as a dataset, the report investigates, among other things, the relative number of EPO and U.S. patent applications and patents in families of these patents. The detailed analysis of these issues remains outside the scope of the present report.

Executive Summary

The subject-matter eligibility criteria applied by the EPO and in the U.S. impose significant constraints on patenting CI inventions in these jurisdictions. There do not appear to have been significant changes to the EPO criteria over the last few years; by contrast the interpretation and application of the U.S. criteria have significantly changed through and following the U.S. Supreme Court's 2014 *Alice* decision, rendering it more difficult to obtain and enforce patents directed to CI inventions in the U.S. However, both the EPO and U.S. methodologies for determining subject-matter eligibility involve legal uncertainty and present difficulties for practitioners, applicant and patent holders. Today, it cannot be concluded that one or the other methodology is clearly more liberal in finding CI inventions to be subject-matter eligible across all contexts.

However it appears that there is greater convergence between the EPO and the U.S. approaches regarding the threshold for patentability of CI inventions compared to 2015, when a draft directive on CI inventions was rejected by the European Parliament. The problems of patent quality nevertheless remain, and it appears that patent troll activity in the U.S. has increased. Although patent troll activity is not yet a large concern in European jurisdictions, the establishment of a

Europe-wide court system for patent litigations through the Unified Patent Court may change this. The analysis of these issues remains outside the scope of the present report.

Based on an empirical study of cloud-computing patents that have been asserted in litigation, we found that European patents are filed less frequently on cloud computing technologies than in the U.S. Even where filed, European patent applications often do not lead to granted patents in the cloud computing technology area. Further, it appears that for cloud-computing inventions that are subject to patent applications, there are many more U.S. patents or applications compared to European patents or applications.

Additionally, new U.S. post-grant procedures before the U.S. Patent and Trademark Office (PTO) for challenging the validity of patents are being frequently used in the cloud computing area. The subject-matter eligibility of cloud computing patents is increasingly being challenged in the U.S. based on the U.S. Supreme Court's *Alice* decision.

Final Report

The trends and current practices in the area of patentability of computer implemented inventions within the EU and the U.S.

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I. Introduction

A. Overview

This report addresses the trends and current practices in the area of patentability of computer-implemented inventions ("CI inventions") within the EU and U.S. It explores special problems of patentability in this technology area, and in particular analyses if and when CI inventions satisfy the subject-matter eligibility requirements for patentability under the current law (i) developed by the Boards of Appeal of the European Patent Office in connection with European patent applications ("EPO law"), and (ii) applied by U.S. courts and the U.S. Patent and Trademark Office. This report overlaps to some extent with the 2008 Commission Report entitled "Study of the effects of allowing patent claims for computer-implemented inventions," but whereas the 2008 report was mostly focused on the impact of patenting of CI inventions on innovation, the economics of innovation and the policy implications, this report is mostly focused on the evolution of the rules governing patent eligibility of CI inventions and the application of these rules in

decisions of courts and administrative bodies.[3] The economic considerations and policy implications of the 2008 report as summarized below remain generally valid. Patent quality remains an issue today, and not only in the U.S.; furthermore, patent troll activity based on patents in the field of CI inventions remains a concern, especially in the U.S. An analysis of these aspects and trends goes beyond the scope of the present report.

Of particular current interest is the impact of the patentability rules for CI inventions in the nascent areas of cloud computing, and this report specifically addresses this problem below.

B. Intellectual Property Protections in Software and Computer Technology

Intellectual property ("IP") rights are intended to incentivize innovation in the specific technology areas in which they are sought and obtained. CI inventions, i.e., all inventions that can be put in practice through the use of a computer considered as a general-purpose or specific-purpose programmable machine, and in particular, inventions incorporated in a computer program, may be protected by patent under certain conditions. Additionally, computer programs, including their corresponding source or object code, as well as their preparatory design materials, can be protected by copyright, which is harmonised in the EU by the 2009/24 Software Directive (which codified the Directive 91/250/EEC on the legal protection of computer programs).

Copyright protects expression in the form of an original work, such as a novel, a painting or a musical composition. Copyright law provides the author of the work with a bundle of rights, including, among others, the right to prevent unauthorized copying of the work, and the right to adapt the work and create derivative works. National copyright laws in the EU and beyond protect computer program code as literary works. In particular, the Software Directive defines the scope of protection of computer programs in EU Member States. This protection only extends insofar as the underlying computer program code (and, depending on the jurisdiction, possibly the structure, sequence and organization (SSO) of the code); it does not protect, for example, an innovative algorithm that is expressed in the code. Similarly, other functional elements of a computer program cannot be protected by copyright. According to the case law of the Court of Justice of the EU, a graphical user interface is not considered part of the underlying computer program, and therefore not subject to the Software Directive, but may be protected as a graphical or audio-visual work under the 2001/29 Copyright in the Information Society Directive.

Although the copyright holder can prevent an unauthorized party from copying the code that implements an algorithm, she may not assert copyright protection to prevent others from implementing the algorithm using different code.

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[3] *Study of the effects of allowing patent claims for computer-implemented inventions*, Final Report and Recommendations (European Commission June 2008) ("2008 Commission Report").

For that reason, copyright protection in the computer programming area is generally thought to provide the greatest benefit in preventing large-scale copying of computer programming products, such as is the case of software piracy.

Patents, on the other hand, may protect the invention that is implemented in a computer programming product. Although a patent may also not be used to protect an algorithm by itself, i.e., divorced from any technological context in which the algorithm is implemented, a patent directed to an algorithm implemented on a device may prevent the unauthorized making, use and/or sale of the device implementing that algorithm. In this respect, patents may provide more comprehensive protection compared to copyright in the area of CI inventions.

In particular, an inventor may obtain a patent directed to her invention, assuming the invention satisfies the criteria for patentability and the inventor fully discloses the invention in her patent application. The patent, once obtained, provides a period of exclusivity during which the inventor/patentee may exclude others from using the invention. While copyright infringement requires showing that the defendant copied the code or protected work, a patent infringement can exist in the absence of any copying. Thus, a patent holder may be able to show infringement and obtain damages and injunctions from another party who independently developed the invention. No proof of an unfair taking or copying is needed. This provides the incentive for inventors and companies to obtain patents to their inventions.

Further, because patent applications and patents are published, public domain knowledge increases as a result of the filing of a patent application, compared to the situation in which the inventor does not apply for a patent and keeps the invention secret (for example, by exploiting the invention secretly). In this way, the patent system both encourages innovation in the technological arts, as well as increases the amount of available public domain information regarding the relevant technologies, which may contribute to driving further innovation.

There are, however, risks that arise from a patent protection that is too broad, too strong or too easy to obtain. Weak patents, which are those patents granted on inventions that do not fairly or fully satisfy the criteria for patentability, may actually harm innovation. For example, such patents may be asserted in lawsuits against innovative companies, which may impose financial, opportunity or other costs on the companies in defending against such lawsuits. If there are a large number of such cases, the benefits of a patent system may not outweigh its potential harms. Some of the risks associated with a patent regime permitting weak CI invention patents to issue are discussed in a 2008 Commission report.

C. 2008 Commission Report on Computer-Implemented Inventions

The 2008 Commission Report entitled "Study of the effects of allowing patent claims for computer-implemented inventions" (CI inventions) focused on the risks associated with a policy of setting a low threshold for subject matter eligibility for granting patents on CI inventions (and thus too easily granting patents to such inventions.) The 2008 Commission Report distinguished between CI inventions and

"software patents". Using the definition in the 2002 Proposal for a Directive of the European Parliament and of the Council on the patentability of computer-implemented inventions (Commission proposal COM(2002) 92), it defined a CI invention as including "any invention the performance of which involves the use of a computer, computer network or other programmable apparatus and having one or more prima facie novel features which are realised wholly or partly by means of a computer program or computer programs."[4] The 2008 Commission Report, on the other hand, referred to a common understanding among software engineers and economists that the term "software patent" denoted a patent that can be infringed by software alone.[5]

The 2008 Commission Report found that allowing the patentability of CI inventions (i) had the potential to stifle innovation by creating a minefield for programmers; (ii) could lead to undue monopolies on interface standards that are magnified by network effects, (iii) could jeopardize open-source software, which it called "the most innovative development of past decades"; and (iv) could lead to the tragedy of the anti-commons, in which too many patent rights granted to too many actors threaten innovation and the development of technology by bogging down the system with a profusion of patent disputes and litigation.[6]

While emphasizing that the patent system may cause more harm than good by imposing barriers to innovation and competition, as well as large transaction costs (which accrue in obtaining and enforcing patents), the 2008 Commission Report advocated neither abolishing the patent system as a whole nor disallowing the patentability of CI inventions.[7] Instead, as long-terms solutions, the 2008 Commission Report proposed (i) increasing the disclosure requirements for patents to weed out low-quality patents, (ii) weeding out low-quality patents through financial means that pose proper incentives, such as adjusting application and renewal fees (e.g., sharply increasing renewals fees for older patents should theoretically lead to the maintenance of higher quality patents and the abandonment of lower quality patents), and (iii) legislative solutions outside of the patent system directed to providing, for example, immunity from patent liability for inventions directed to interoperability and technology standards.[8]

The 2008 Commission Report briefly touched upon the subject-matter eligibility requirement for patentability of CI inventions as applied by the EPO.[9] It found that the EPO's requirement for a technical contribution was not coherent, led to legal uncertainty, and did not clearly prevent certain subject matter from being patented.[10] More importantly, it stated that the EPO, as a technocratic organization focused on technical requirements for patentability, lacked the ability of oversight based on a comprehensive economic view.[11] Regarding subject-matter eligibility

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[4] *Id*. at 5.
[5] *Id.*
[6] 2008 Commission Report at 11-12.
[7] *Id*. at 30.
[8] *Id*.
[9] *Id*. at 7-9.
[10] *Id*. at 8.
[11] *Id*. at 21.

requirements in the U.S., the 2008 Commission Report mentioned in passing, based on now out-dated U.S. law, that there were essentially no limits on pure software and business method patents in the U.S., implying that that such low thresholds for patentability had led to a tidal wave of applications and low-quality patents.[12]

It is not entirely clear whether the policy conclusions and recommendations reached in the 2008 Commission Report provide a path to a stronger software-based economy in Europe. On the other hand, the opposite has not been demonstrated either. The 2008 Commission Report was sceptical at best regarding any positive economic consequences of the patentability of CI inventions. The patent eligibility criteria for CI inventions in Europe have been much stricter than those in the U.S. until relatively recently. At the same time, the European software industry is generally perceived to be less dynamic and strong compared to that of the U.S. For example, other than a few isolated exceptions, such as SAP SE ("SAP"), there appear to be no large European software-focused or Internet-based companies like Microsoft, Amazon, Google, Facebook and Apple that are leaders in their respective industries. (Nevertheless a number of European companies have been able to integrate innovative digital solutions in their products and processes.) Additionally, based on venture capital activity in the U.S. and Europe, it cannot be said that European software-based SMEs are in a better or stronger position compared to U.S. software-based SMEs.[13] Thus, one may infer that a relatively strict approach to patent eligibility for CI inventions does not have any positive economic benefits for the computer and software industry. On the other hand, the fact that the converse has not been demonstrated suggests that it is possible that the policy and law on the patentability of CI inventions has no or little impact on the advancement of the software industry.

D. The European and U.S. Patent Systems

One practical problem that arises in considering the rules for patentability of CI inventions in Europe is the fact that there is no single, harmonised patent system in Europe. In particular, patents in Europe may be obtained by either (i) filing a number of national patent applications at the relevant patent offices of the EU Member States and prosecuting each of these to grant, or (ii) filing a single application at the European Patent Office, prosecuting it to grant (thus obtaining a "European patent") and then validating that European patent in the relevant EU Member States of interest. Currently, patents in EU Member States may only be enforced by separately filing patent suits in the court systems of the EU Member States where a national patent has been granted or where a EPO-granted European patent has been validated.[14] Such court proceedings are subject to national patent

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[12] *Id*. at 21-22.

[13] *Towards a European Software Strategy: Working Group 4 : Public Procurement – Financing Software Innovation,* Draft v.005 (final document, 3.24.2009).

[14] Pursuant to a proposed international agreement among nearly all EU Member States, a Unified Patent Court is to be established for the settlement of disputes relating to European patents and European patents with unitary effect. *Agreement on a Unified Patent Court*,

laws and regulations. Although the substantive patent laws of the EU Member States are by and large consistent with one another and that of the European Patent Convention ("EPC"), which provides the substantive patent law applied by the EPO, there are in fact differences in interpretation and application of patent law across EU Member State jurisdictions. Further, asserting a single EPO patent in a number of European jurisdictions involves initiating separate patent infringement lawsuits in each of those European jurisdictions, greatly increasing the costs associated with litigation.

Further, and apart from enforcement, there is also fragmentation of the method of obtaining a patent in European jurisdictions. For example, in a first scenario, an applicant desiring a patent to her invention in France, Germany and the UK may file the respective translations of the same patent application in the respective national patent offices of these jurisdictions. The applicant would then have to separately prosecute the application in each of these patent offices and separately satisfy the requirements set forth by the examiners of these offices during prosecution. In a second scenario, the applicant may file and prosecute a single patent application at the EPO. Assuming the EPO eventually granted a European patent, the applicant would then have to validate the European patent separately in each of the respective national patent offices through an essentially clerical procedure to obtain the desired national patents.

Although an applicant could obtain the desired French, German and UK patents in either scenario, and although the formal requirements for patentability may be substantially similar in France, Germany, the UK and before the EPO, there inevitably are differences in interpretation that effectively lead to differences in practice. For example, most legal systems provide that rejections of a patent application by the national patent office may be appealed to the respective national court systems. These national court systems decide individual cases based on principles established and prior cases heard in their respective jurisdictions. In this way, a nationally specific practice regarding patentability inevitably develops and evolves in each of these jurisdictions that may not be entirely consistent with those of the other jurisdictions, and which may not be entirely consistent with the practice of the EPO. Consequently, and in practice, the requirements that applicants face in these jurisdictions may differ from one another as well as differ from those of the EPO.

In the U.S., there is much less geographical diversity in the substantive patent law that is applied to CI inventions; there is a single patent system in which the same patent law is applied by the U.S. Patent & Trademark Office ("PTO") during the prosecution stage as is applied by the courts during enforcement. Further, a single appeals court, the U.S. Court of Appeals for the Federal Circuit, hears nearly all appeals from courts of first instance decisions relating to patent issues (where disputes heard include both appeals from U.S. PTO decisions during patent prosecution regarding patentability and disputes relating to patent infringement and validity between parties.) This tends to result in a more coherent

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2013 O.J. (C 175) 1. Once the Agreement goes into force, there will be a mechanism for pan-European enforcement of European patents and European patents with unitary effect in a single court system.

and predictable patent law, at least compared to that of European jurisdictions taken collectively.

One other characteristic of the U.S. patent system is that patent infringement damages awards are much higher, on average, in the U.S. compared to those of European courts. This likely incentivizes patent holders to assert their U.S. patents in lawsuits to a greater degree than European patents. On the other hand, because of the much more liberal standard for evidentiary discovery in lawsuits in the U.S., U.S. patent litigation is far more expensive than patent litigation in European jurisdictions. This fact likely makes it harder for SMEs in the U.S. to assert their patents compared to SMEs in Europe.

Given the complexity of the European system, one practical problem in undertaking a comparison of the European and U.S. rules in connection with CI inventions is which European patent system to use in carrying out the comparison. For example, should one use the German system as the best representative European practice, given that an overwhelming majority of patent-related disputes in Europe are heard by the German courts ? Or should one use the EPO practice (including the decisions of the EPO Boards of Appeal) as being representative, since most patent applicants interested in obtaining a patent in several EU countries apply for their patents through the EPO? Or should one comprehensively study the case law in all EU jurisdictions, try to identify commonalities in case law and national patent office decisions across all these EU jurisdictions, and then enunciate a "European" patent practice based on any such commonalities?

In undertaking the current limited-scope study, the authors have chosen the second option, i.e., using EPO-developed rules, as representative of European practice. Unlike the first option, this option does not focus only on rules for patent eligibility of CI inventions in a single European jurisdiction (albeit the country with the highest number of court decisions), and unlike the third, does not entail a wide-ranging project that has low prospects for success, given the large number of patent systems involved (i.e., all EU Member States and the EPO.) Further, it is likely that applicants would choose to obtain patents on high-value CI inventions in several European jurisdictions rather than just in a single or two European jurisdictions, rendering it more likely that they would file applications on such inventions at the EPO, given the more favourable costs regime compared to the scenario of avoiding the EPO and filing several European national applications at the respective national patent offices. Therefore, the EPO rules on the patent eligibility of CI inventions should act as a good and workable proxy for the rules in Europe as a whole.

Accordingly, this report deals with this methodological problem by focusing on the patentability criteria for CI inventions as applied by the EPO during prosecution of a European patent application.

E. A Major New European Development: The Unified Patent Court

A Unified Patent Court ("UPC")[15] is being established pursuant to an intergovernmental treaty among nearly all EU Member States. The UPC is to have exclusive competence in respect of certain designated European patents (in particular, European patents with unitary effect, which will be obtained through designation at the EPO by applicants for European patents), subject to certain exceptions during a transitional period. The UPC, however, will not have any jurisdiction over national patents obtained through the patent office of an EU Member State.

The UPC would for the first time establish a single EU court system to hear patent disputes. For this reason, it is likely that it will eventually develop a more coherent and uniform interpretation of patent rules within the EU, such as the rules for patent eligibility of CI inventions. However, given that the UPC will not have exclusive jurisdiction of all patent disputes within the EU, its establishment is unlikely to eliminate all non-harmonised aspects of patent law across the EU. This is compounded by the fact that the national patent office routes for obtaining patents in EU Member States will continue to be available to applicants. However, the UPC is probably a major first step in the direction of an EU patent law that is truly harmonised based on case-law decisions.

F. Types of CI Inventions

As discussed in the 2008 Commission Report, CI inventions vary widely in scope and other characteristics:

> As we already discussed, "software inventions" is a misleading designation. And if still "software inventions" are distinguished, it should be acknowledged that the realm of "software-related inventions" conceivably encompasses inventions with widely varying economic characteristics, a reason why previous software patent studies rarely lead to unequivocal recommendations, despite the conventional wisdom that "software patents" do more harm than good (Bakels & Hugenholtz 2002). The diversity of "software inventions" becomes apparent e.g. from landmark court cases, showing topics as varying as oscilloscope image enhancement (VICOM, T 208/84) and database synchronisation (IBM Computer Program Product I, T 1173/97). Previous studies have classified CIIs into a large number of "case groups" (Blind, Edler, Nack & Straus 2002).

2008 Commission Report at 12.

Given this diversity, it is difficult to enunciate a scheme for classifying CI inventions that is satisfactory for all purposes. However, for purposes of illustration, we provide below a description of some specific types of CI inventions discussed in this report:

[15] *See* https://www.unified-patent-court.org/ for relevant sources and the latest information on the UPC.

Graphical User Interface inventions. These are CI inventions directed to the presentation of information on a screen of a device for the benefit of a human user of the device. For example, there could be innovation that is potentially eligible for patenting in connection with automatically arranging multiple windows opened by a user on a screen in such a way that maximizes the access of the user to the multiple windows without requiring excessive user rearrangement of the windows.

Image Processing Inventions. These are CI inventions directed to the manipulation of digitized representations of images to maximize the quality of the images and/or the throughput of images through a limited transmission channel.

Data Transmission Inventions. These are CI inventions directed to improving data transmission, by, e.g., compressing data to maximize data transmission through bandwidth-limited channels, or encrypting data to ensure secure transmission.

Cloud Computing Technology Inventions. As defined by the U.S. National Institute of Standards and Technology ("NIST"), cloud computing is "a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction."[16] Most, or possibly nearly all, cloud computing inventions are CI inventions, because they necessarily involve one or more networked computers. We discuss cloud computing in more detail further below in this report, and have carried out an empirical study of the impact of patent eligibility criteria in the U.S. and in Europe on cloud computing patents, which is also discussed further below in this study.

II. The Legal Problem of Patenting of CI Inventions

A. A Chronology of Developments at the EPO and in the U.S.

The patent eligibility of CI inventions has been a difficult issue on both sides of the Atlantic. In Europe, the law of patent eligibility of CI inventions has evolved through the case law of the EPO's Technical Boards of Appeal from initial decisions that required a technical effect or contribution that went beyond ordinary interactions between software and hardware, to an approach that in most cases imposed a relatively low threshold for finding a technical effect, but required, as part of the distinct inventive step analysis, that only features contributing to technical character be considered in determining whether the invention satisfied the inventive step requirement. This evolution, which took place over a time scale of approximately six years, led the Enlarged Board of Appeal of the EPO in 2008 to

[16] P. Mell and T. Grance*, The NIST Definition of Cloud Computing, Recommendations of the National Institute of Standards and Technology*, Special Publication 800-145, National Institute of Standards and Technology, U.S. Dept. of Commerce (2011) ("NIST Definition").

consider questions relating to the patentability of CI inventions referred to it by the President of the EPO.[17] Although the Enlarged Board of Appeal found the referral to be inadmissible on the grounds that the EPO case law was not inconsistent and reflected normal legal evolution, there has been continued criticism that EPO case law on the patentability of CI inventions is not coherent.[18]

In the U.S., the rules regarding the law of patent eligibility of CI inventions have fluctuated even more rapidly compared to Europe. Although the U.S. Supreme Court had found certain CI inventions patentable in a decision as early as 1981,[19] the U.S. PTO did not begin granting patents to CI inventions in great profusion until after a 1998 appeals court decision appeared to greatly lower the patent subject-matter eligibility threshold in a decision in which the court stated that a calculation that produces a "useful, concrete and tangible result" is in principle patentable.[20] CI inventions, including CI inventions that were also business methods, began to be patented in increasing numbers throughout the early years of the millennium. This period was also characterized by a continually increasing number of patent assertion entity litigations based on such patents (many of which were thought to be of low quality) in the U.S.[21] The tide finally turned beginning with a string of Supreme Court decisions, including the *Mayo* decision of 2012, and the Supreme Court's subsequent decision in *Alice*, which more specifically focused on the patentability of CI inventions.[22] These decisions have been interpreted by the PTO, the courts and most U.S. practitioners as significantly raising the threshold for subject-matter patent eligibility of CI inventions in the U.S.

B. Nature of the Legal Problem

The 2008 Commission Study focused on the economic considerations and consequences of patenting of CI inventions, while noting that the legal rules determining patent subject-matter eligibility of CI inventions were not coherent.[23] Regardless of the potential economic impact, why has it been so hard to articulate a coherent set of rules in this area that are capable of easy application by the patent offices, courts, practitioners, patentees and patent applicants? One reason may be the great diversity of types of CI inventions that may be covered across vast

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[17] *G-3/08, Programs for Computers*, [2010] O.J.E.P.O 17, (EPO Enlarged Bd. Appeal, May 12, 2010), *available at* http://documents.epo.org/projects/babylon/eponet.nsf/0/DC6171F182D8B65AC125772100426656/$File/G3_08_Opinion_12_05_2010_en.pdf.
[18] 2008 Commission Report at 6-9.
[19] *Diamond v. Diehr*, 450 U.S. 175 (1981) (finding that the use of an algorithm to control the carrying out of a physical process did not preclude patentability of the invention).
[20] *State Street Bank & Trust v. Signature Financial Group*, 149 F.3d 1368 (Fed. Cir. 1998).
[21] *See, e.g.*, *Patent Assertion and U.S. Innovation*, Executive Office of the President (2013) at 5.
[22] *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 132 S. Ct. 1289 (2012) ("*Mayo*"); *Alice Corp. v. CLS Bank International*, 134 S. Ct. 2347 (2014) ("*Alice*").
[23] 2008 Commission Report at 8.

technology areas, and the various levels of abstraction in which such CI inventions may be attempted to be patented. For example, at one extreme, a CI invention may involve, at a relatively high level of abstraction, conversion of units from one system to another, e.g., from metric to British Imperial units and vice versa. Assuming other requirements for patentability, such as novelty and inventive step, are satisfied, such an invention may be patentable, subject to subject-matter eligibility requirements. Most practitioners, however, would likely agree that allowing subject-matter eligibility of such an invention would provide the patentee the right to exclude others from using the invention in a vast array of scenarios, independent of the particular technology area of application. For example, potential users would be pre-empted from using the invention in areas of application as distinct and varied as space technology (e.g., users in a space program project involving the ESA and NASA), automotive technologies (e.g., car manufacturers marketing slightly different versions of the same automobile in multiple jurisdictions), internet weather data platforms (e.g., providing weather data to users in multiple jurisdictions), mapping technologies (e.g., in which users from multiple jurisdictions access mapping data from a database) etc. Most reasonable practitioners would argue that the subject-matter eligibility threshold should be kept high to prevent the patentability of such an invention, even if it satisfies the other requirements for patentability, such as novelty and inventive step.[24]

At another extreme, a CI invention may involve, at a much lower level of abstraction, an improved computer-controlled process for curing rubber using a new temperature profile for the curing that leads to stronger and more flexible rubber end product. Assuming the novelty and inventive step requirements are satisfied, the inventor may seek a patent directed to a computer-controlled process for curing the rubber according to the new temperature profile. Many reasonable practitioners would agree that such an invention should be patentable, and that the subject-matter eligibility rules should not bar a patent in such a case.[25]

There is a vast array of potential CI inventions that lie between these two extremes, and it is difficult to articulate a succinct legal rule that would coherently demarcate a borderline of patentability that would be acceptable to most reasonable practitioners.[26]

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[24] *See, e.g.*, *Gottschalk v. Benson*, 409 U.S. 63 (1972). In this case, the U.S. Supreme Court found that an invention to a process implementing a mathematical algorithm was not patentable because "the patent would wholly pre-empt the mathematical formula and in practical effect would be a patent on the algorithm itself." *Id*. at 71-72.

[25] *See, e.g.*, *Diamond v. Diehr*, 450 U.S. 175 (1981) (finding that the use of an algorithm to control the carrying out of a physical process did not preclude patentability of the invention).

[26] For example, under the currently applicable rules for subject-matter eligibility in the U.S., a graphical user interface invention comprising the steps of (i) monitoring the boundaries of two displayed windows, and (ii) automatically relocating textual information in one of the windows upon detecting an overlap of the windows is likely subject-matter eligible. *July 2015 Update: Subject Matter Eligibility*, Appendix 1: Examples (U.S. PTO July 30, 2015) at 7. The same invention is likely not patentable under the subject-matter eligibility rules of the European Patent Office. *See, e.g.*, *T 1562/11* (*Closing out white space/SAP*), (EPO Bd. Appeal, June 3, 2015), *available at* https://www.epo.org/law-practice/case-law-appeals/recent/t111562eu1.html.

C. Statutory Basis for Subject Matter Eligibility in EPO Law and in the U.S.

The rules for subject-matter eligibility in both the EPO and in the U.S. are based on statutory provisions. However, these statutory provisions are not sufficiently specific to resolve most disputes involving questions of subject-matter eligibility.

The EPO applies the rule for subject-matter eligibility that is set forth in Article 52 of the European Patent Convention ("EPC"):

> *Article 52 Patentable Inventions*
> *(1) European patents shall be granted for any inventions, in all fields of technology, provided that they are new, involve an inventive step and are susceptible of industrial application.*
> *(2) The following in particular shall not be regarded as inventions within the meaning of paragraph 1:*
> *(a) discoveries, scientific theories and mathematical methods;*
> *(b) aesthetic creations;*
> *(c) schemes, rules and methods for performing mental acts, playing games or doing business, and programs for computers;*
> *(d) presentations of information.*
> *(3) Paragraph (2) shall exclude the patentability of the subject-matter or activities referred to therein only to the extent to which a European patent application or European patent relates to such subject-matter or activities as such.*

Thus, EPC Article 52(2)(c) specifies that "programs for computers" shall not be regarded as inventions for which a patent can be granted. However, Article 52(3) excludes the patentability of the computer program subject-matter or activities "only to the extent to which a European patent application or European patent relates to such subject-matter or activities as such." The general nature of the exclusion, and the use of the vague term "as such" in the carve-out from exclusion in Article 52(3), have left it open for the EPO Boards of Appeal to interpret the breadth of the carve-out from the exclusion.

Section 101 of U.S. patent law (set forth at 35 U.S.C. Section 101 *et seq*.) even more generally specifies that "[w]hoever 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 therefor, subject to the conditions and requirements of this title." This has led the courts and the PTO, and most significantly, the U.S. Supreme Court, to interpret the breadth of patent eligible subject-matter based on this statutory language. The Supreme Court had earlier established that laws of nature, natural phenomena, and abstract ideas are not

patentable subject matter under Section 101.[27] Because of this, and given the nature of computer programs, the subject matter eligibility of CI inventions has usually been considered in relation to the exclusion of abstract ideas from patentability.

D. The Inventive Step Requirement for Patentability

Nearly all patent systems, including those of the EPO and the U.S., separately require that a patentable invention be both new and have inventive step.[28] Although inventive step, like novelty, is a requirement for patentability that is distinct from subject-matter eligibility, the EPO's manner of determining subject-matter eligibility for CI inventions overlaps with its inventive step requirement. The current law on subject-matter eligibility in the U.S. also partially invokes notions that are part of the novelty and inventive step inquiries, although not as formally as in the EPO. For that reason, this paper briefly discusses these requirements for patentability.

The requirement that an invention be new to be patentable (i.e., the novelty requirement), reflects the commonsensical notion that exclusivity should not be granted to an inventor who has not invented something new. Generally speaking, a patent office will reject a claim in a patent application on the basis of lack of novelty if the patent office is able to identify a single piece of prior art (e.g., an earlier product or process, an earlier article or a patent or published application with an earlier priority date) that discloses all features of the invention set forth in that claim. Similarly, a court handling a patent challenge may decide that a claim in an issued patent is invalid based on such a finding.

The inventive step requirement is assessed by determining, having regard to the state of the art at the time of filing of the patent application being examined, whether the invention would have been obvious to a person skilled in the art.[29] Because of the broad-ranging and general nature of this inquiry, the EPO has developed a specific formalism, called "the problem-solution approach", for determining whether an invention satisfies the inventive step requirement.[30] In this approach:

1. First determine the closest, i.e., most relevant, prior art to the invention, and then determine the differences between that closest prior art and the invention,
2. Determine, with respect to the closest prior art, the objective technical problem that the invention solves, i.e., determine the

[27] *Diamond v. Diehr*, 450 U.S. 175 (1981) at 185.
[28] *See, e.g.*, EPC Articles 54, 56; 35 U.S.C. §§ 102, 103.
[29] *See, e.g.*, EPC Article 56.
[30] *See, e.g.*, *Case Law of the Boards of Appeal of the European Patent Office* (7th Edition, September 2013) at Section I.D., *available at* http://www.epo.org/law-practice/legal-texts/html/caselaw/2013/e/clr_i_d.htm.

technical effect brought about by the differences between the closes prior art and the invention, and

3. Determine whether the invention's solution to the objective technical problem would be obvious to the person of ordinary skill in the technology area (i.e., art) concerned.

How this formalism is applied in practice is discussed further below in connection with a particular example.

E. The Subject-Matter Eligibility Requirement for Patentability in EPO Law

1. The Requirement of Technical Character

Case law of the Technical Board of Appeal generally requires that a patentable invention have "technical character".[31] The technical character threshold for patentability has fluctuated somewhat in the case law of the Technical Board of Appeal, and related terms and concepts such as "technical contribution", "technical effect", "further technical effect" and "technical consideration" have been employed as part of the technical character inquiry from time-to-time. However, the current practice of the Technical Board of Appeal (and more generally of the EPO), is to impose a relatively low technical character threshold for most CI inventions. For example, the Board has found the following inventions to have the requisite technical character for patentability:

- Processing information using a conventional computer programmed in a specific way to carry out a computerised translation process provided a technical aspect (and thus conferred technical character) to non-technical things such as dictionaries, word matching or the translation of compound expressions into a corresponding meaning.[32]
- A computer-implemented method including mathematical steps for simulating the performance of a circuit subject to a particular noise profile.[33]

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[31] *See, e.g., T 0931/95 (Controlling pension benefits system)*, (EPO Bd. Appeal, Sep. 8, 2000), *available at* https://www.epo.org/law-practice/case-law-appeals/recent/t950931ep1.html; *T 1173/97 (Computer program product/IBM*), (EPO Bd. Appeal, July 1, 1998), *available at* https://www.epo.org/law-practice/case-law-appeals/recent/t971173ex1.html; *T 0935/97 (Computer program product II/IBM*), (EPO Bd. Appeal, Feb. 4, 1999), *available at* http://www.epo.org/law-practice/case-law-appeals/recent/t970935eu1.html.

[32] *T 1177/97 (Translating natural languages/SYSTRAN,* (EPO Bd. Appeal, July 9, 2002), *available at* https://www.epo.org/law-practice/case-law-appeals/recent/t971177eu1.html.

[33] *T 1227/05 (Circuit simulation I/Infineon Technologies)*, (EPO Bd. Appeal, Dec. 13, 2006), *available at* https://www.epo.org/law-practice/case-law-appeals/recent/t051227ep1.html.

- A method of providing expanded clipboard formats in a clipboard feature in a word processing system (which allows the user to cut and copy text for pasting to another section of a document) for transferring data between formats. The relevant method was part of a claim directed to a computer program stored on a computer-readable storage medium.[34]
- A computer-implemented data structure for representing visual data (a picture access data structure) had technical character, because a playback device could only exercise its function of fast display of stored pictures using the data structure. The representation of information in the data structure was not directly usable by a human, but had to be processed by the technical playback device; thus, the exclusion of presentation of information under EPC Article 52(2) was not invoked.[35]

In particular, the more recent decisions of the EPO Boards of Appeal state a CI invention claim can avoid exclusion under Art. 52(2)(c) and (3) EPC merely by expressly reciting the use of a computer, a computer network or a computer readable storage medium, because these elements have technical character.[36]

On the other hand, the EPO appears to apply a stricter rule when the patent claim is directed to a "computer program" (e.g., as opposed to either of (i) a method claim to a CI invention that does not directly recite a computer program, but whose steps are or can be carried out by a computer, or (ii) a computer-readable medium storing a computer program, which when executed by a processor, carries out a certain functionality). In particular, in this case, the computer program must be "capable of bringing about, when running on or loaded on a computer, a further technical effect going beyond the 'normal' physical interactions between the program (software) and the computer (hardware) on which it is run."[37] Additionally, although all computer programming involves technical considerations to some degree, such technical considerations may confer technical character on the invention only if there were technical programming considerations beyond merely finding a computer algorithm to carry out the relevant functionality.[38] Control of an industrial process, the internals of the computer program that affect the efficiency or security of a process, management

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[34] *T 0424/03 (Clipboard formats I/MICROSOFT)*, (EPO Bd. Appeal, Feb. 23, 2006), *available at* http://www.epo.org/law-practice/case-law-appeals/recent/t030424eu1.html.
[35] *T 1194/97 (Data structure product/PHILIPS)*, (EPO Bd. Appeal, March 15, 2000), *available at* https://www.epo.org/law-practice/case-law-appeals/recent/t971194ex1.html.
[36] *See, e.g.*, *G-3/08, Programs for Computers*, [2010] O.J.E.P.O 17, (EPO Enlarged Bd. Appeal, May 12, 2010), *available at* http://documents.epo.org/projects/babylon/eponet.nsf/0/DC6171F182D8B65AC125772100426656/$File/G3_08_Opinion_12_05_2010_en.pdf; *Guidelines for Examination in the European Patent Office, Part G, EPO Guidelines for Patentability,* Chapter II-3.6 (Nov. 2015), *available at* http://www.epo.org/law-practice/legal-texts/html/guidelines/e/index.htm.
[37] *Id.*
[38] *Id.*

of the required computer resources, or data transfer rates of the a communication link are aspects that may lead to a finding of a further technical effect.[39]

2. The Interaction between the Subject-Matter Eligibility Requirement and the Inventive Step Requirement

As discussed above, in patents directed to CI inventions, where the claim is not directed to a computer program, the EPO's formal requirements for subject-matter eligibility appear to impose a relatively low threshold. However, the EPO has partially conflated the subject-matter eligibility requirement and the inventive step requirement by separately and additionally requiring that any non-technical feature of the invention, in other words, any feature of the invention that is excluded from patentability under Article 52(2) and (3) of the EPC, is not to be taken into account in assessment of inventive step (unless there is some interaction between technical and non-technical features in solving a technical problem.)

For example, if the inventive step of the claim resides only in presentation of visual data on a graphical user interface to the user, the EPO has stated that this feature cannot on its own confer inventive step to the claimed invention, because it is not a technical feature given the exclusion in EPC Article 52(2)(d) of presentations of information.[40] In a relevant case, the invention was a system and method for accessing data files in a computer-based database involving representing the files as elements on the display for user selection.[41] The EPO found that the invention did not "solve a problem that is directly concerned with the search for and retrieval of information, since the only new feature relates to the movement of displayed elements."[42] Further, the user's selection of an element corresponding to a file was merely "a mental act". For that reason, the EPO failed to find any technical features that contributed to inventive step, and found the invention unpatentable for lacking inventive step.[43]

Thus, the inventive step requirement at the EPO is not entirely independent of the inquiry into subject-matter eligibility, and part of the work of the subject-matter eligibility criterion has been effectively offloaded to the inventive step requirement.

3. The *Hitachi* Decision

A good example of how the subject-matter eligibility criterion and inventive step requirement interact in EPO case law is provided by the *Hitachi* decision of the

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[39] *Id.*
[40] *T 1562/11 (Closing out white spa*ce/SAP*)*, (EPO Bd. Appeal, June 3, 2015*), available at* https://www.epo.org/law-practice/case-law-appeals/recent/t111562eu1.html.
[41] *T 1143/06 (Data selection system/BRITISH TELECOMMUNICATIONS)*, (EPO Bd. Appeal, April 1, 2009), *available at* https://www.epo.org/law-practice/case-law-appeals/recent/t061143eu1.html.
[42] *Id.*
[43] *Id.*

EPO Technical Board of Appeal.[44] The relevant invention was directed to a computer-implemented method for carrying out an automatic auction. The main claim at issue in the case was as follows:

> *1. An automatic auction method executed in a server computer comprising the steps of:*
>
> > *a) transmitting information on a product to be auctioned to a plurality of client computers via a network, each client computer belonging to a bidder;*
> >
> > *b) receiving a plurality of auction ordering information pieces, each including a desired price and a maximum price in competitive state, for purchase of said product, from the plurality of client computers via the network;*
> >
> > *c) storing the received auction ordering information pieces in the server computer for respective bidders;*
> >
> > *d) setting an auction price;*
> >
> > *e) determining whether there is any bidder who proposes a desired price equal to or higher than the auction price using the auction ordering information pieces stored in the server computer;*
> >
> > *f) if there is no bidder in the step e), lowering the auction price, and repeating the step e);*
> >
> > *g) if there is more than one bidder at step e), judging whether there is more than one bidder for whom the auction price is less than or equal to the desired price such that a competitive state occurs using the auction ordering information pieces stored in the server computer;*
> >
> > *h) if the competitive state occurs, increasing the auction price by a predetermined value;*
> >
> > *i) excluding the bidder who proposes acceptable a price lower than the increased auction price and specifying the other bidder or bidders using the auction ordering information;*
> >
> > *j) judging whether the competitive state occurs among the bidder or bidders specified in the step i);*
> >
> > *k) repeating the steps h), i) and j) and determining the remaining bidder as a successful bidder when there is no competitive state at step j; and l) if no competitive state occurs in the step g), determining the remaining bidder as a successful bidder.*

Claim 3, which was also at issue, was directed to a "computerized auction apparatus for performing an automatic auction via a network, among a plurality of bidders, the bidders using a corresponding plurality of client computers", the apparatus comprising means for performing the steps set out in claim 1. The description section of the patent application discloses computer means for carrying out the disclosed invention.[45]

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[44] *T 0258/03 (Auction method/HITACHI)* (EPO Bd. Appeal, April 21, 2004), *available at* https://www.epo.org/law-practice/case-law-appeals/recent/t030258ex1.html ("*Hitachi*").
[45] *See, e.g.*, European patent application EP0828223 at col. 5, lines 6-46.

In assessing subject-matter eligibility, the Board first considered claim 3. It found that because this claim included technical features such as a "server computer", "client computers" and a "network", it satisfied the subject-matter eligibility criterion of Article 52(1) EPC.[46] The Board further noted that claim 1, even though it was directed to a method (as opposed to an apparatus as in claim 3), satisfied the subject-matter eligibility criteria for the same reason.[47]

The Board, however, found none of the claims patentable due to lack of inventive step. In the inventive step inquiry, the Board considered the applicant's assertion that the invention solved the problem in the prior art of delays in propagation of information between the bidders and the server. The Board found that the closest prior art disclosed an online auction system in which the timing of bids made was included in information sent to the central server handling the auction (or, alternatively, in which a delay was imposed at the client's computer in transmitting the bid to the central server to achieve synchronization among bids that were made).[48] The Board further found that the subject invention solved the propagation delay problem by adapting the auction method such that it could be performed automatically (by transmission of both the bidder's desired price and the bidder's maximum price) without consideration of timing information of the bids that were made.[49] However, the Board stated:

> *In the Board's view, however, this solution does not contribute to a technical character and cannot therefore be taken into account for assessing inventive step since it concerns the rules of the auction, i.e. it is not a technical solution to the delay problem described (and solved by technical means) [in the cited prior art references], but a solution entirely based on modifications to the auction method. Method steps consisting of modifications to a business scheme and aimed at circumventing a technical problem rather than solving it by technical means cannot contribute to the technical character of the subject matter claimed.*[50]

The Board found that the other, technical features of the invention, such as the data transmission and storage features (e.g., steps (b) and (c) of claim 1) were standard features which were known in the prior art; thus, they also did not confer inventive step on the invention. Based on these considerations, the Board found that none of the claims at issue satisfied the inventive step criterion.[51]

4. EPO Guidance

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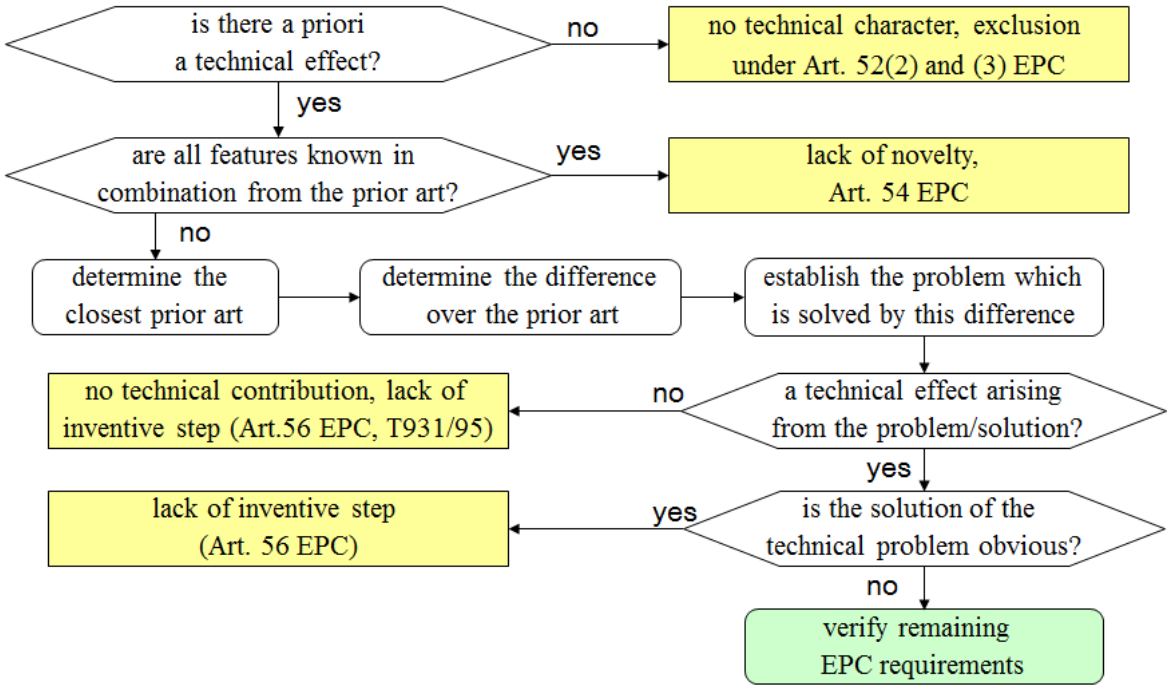
[46] *Hitachi*.
[47] *Id.*
[48] *Id.*
[49] *Id*.
[50] *Id*.
[51] *Id*.

The EPO, in addition to publishing the case law of its Boards of Appeal, also provides guidance materials on patentability, including subject-matter eligibility for CI inventions.[52]

The EPO is also a resource for other materials relating to the patentability of CI inventions. The following flowchart summarizes the steps in determining the patentability of an invention, and, in particular, a CI invention at the EPO. The flowchart depicts, in addition to the subject-matter eligibility and inventive step inquiries as discussed earlier, the novelty requirement for patentability.



G. Herreman, Patentability of Computer-Implemented Inventions, European Patent Office (Discussion Workshop on Understanding the CII Directive 2005) at slide 24

F. The Subject-Matter Eligibility Requirement for Patentability in the U.S.

1. The *Alice* Case and the *Mayo* Framework

[52] *See, e.g.*, *Guidelines for Examination in the European Patent Office, Part G, EPO Guidelines for Patentability* (Nov. 2015), *available at* http://www.epo.org/law-practice/legal-texts/html/guidelines/e/index.htm.

The U.S. Supreme Court had by the early 1980s established that laws of nature, natural phenomena, and abstract ideas are not patentable subject matter under Section 101.[53] Additionally, as discussed earlier, a liberal phase of subject-matter eligibility for CI inventions that began in 1998 ended with a string of Supreme Court decisions beginning in 2010.[54] In particular, these decisions overturned a relatively low-threshold methodology that had been developed by the U.S. Court of Appeals for the Federal Circuit ("Fed. Cir.") for assessing subject-matter eligibility of CI inventions. Although the new formalism set forth by the Supreme Court was first enunciated in the *Mayo* case in the context of subject-matter eligibility of an invention that invoked a law of nature, it was first applied by the Supreme Court in the context of CI inventions in the *Alice* case ("*Mayo* framework").

The inventions in the *Alice* case involved electronic methods for financial-trade systems that mitigated settlement risk, which is the risk that a party to contractual financial exchange will not satisfy its obligation.[55] In these inventions, a properly programmed computer acts as a third-party intermediary that creates shadow credit and debit records that mirror the balances in the parties' actual accounts at financial institutions such as banks.[56] The intermediary updates these shadow records in real time as transactions are initiated, and allows only those transactions for which the parties' updated shadow records indicate sufficient resources to satisfy their mutual obligations.[57] By directing the financial institutions accordingly, the intermediary mitigates the risk that only one of the parties performs it obligations.[58]

In reaching the decision, the Supreme Court first considered whether the invention was directed to an abstract idea excluded from subject-matter eligibility pursuant to the earlier Supreme Court decision in *Diehr*.[59] The Supreme Court found that it was, because the relevant claims were drawn to the concept of intermediated settlement, which is "a fundamental economic practice long prevalent in our system of commerce."[60] In so doing, the Supreme Court looked to and cited references including academic business publications describing intermediated settlement as a building block of the modern economy.[61]

After the first step in the *Mayo* framework of assessing whether the invention is directed to an abstract idea, the court considered the second step, which comprises determining whether the invention comprises an inventive concept sufficient to transform the claimed abstract idea into a patent-eligible application. According to the Supreme Court, to be patentable, the claim directed to an abstract

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[53] *Diamond v. Diehr*, 450 U.S. 175 (1981) at 185.
[54] *Alice Corp. v. CLS Bank International*, 134 S. Ct. 2347 (2014); *Mayo Collaborative Servs. v. Prometheus Labs., Inc*., 132 S. Ct. 1289 (2012); *Bilski v. Kappos*, 561 U.S. 593 (2010).
[55] *Alice* at 2351-52.
[56] *Id*. at 2352.
[57] *Id.*
[58] *Id.*
[59] *Diamond v. Diehr*, 450 U.S. 175 (1981) (finding that the use of an algorithm to control the carrying out of a physical process did not preclude patentability of the invention).
[60] *Id*. at 2356.
[61] *Id*.

idea must include "additional features" to ensure "that the claim is more than a drafting effort designed to monopolize the abstract idea".[62] The Supreme Court in this step found that the mere recitation of a generic computer to carry out the relevant functionality "cannot transform a patent-ineligible abstract idea into a patent-eligible invention."[63] Further, neither mere application, without more, of the abstract idea, nor limiting the use of the abstract idea to a particular technological environment was sufficient to render the claimed invention patent eligible.[64] These findings of the Supreme Court were based on its concern that patent eligibility in these circumstances would allow monopolization of the abstract idea, i.e., pre-emption of use of the idea in a vast array of technology areas.[65]

In considering the relevant elements of the claimed invention in the second step of the *Mayo* framework, the Supreme Court in particular found that functionalities such as electronic recordkeeping, obtaining data, adjusting account balances and issuing automated instructions are "well-understood, routine, conventional activities previously known to the industry."[66] These functionalities, according to the Supreme Court, were generic computer functions that could not confer subject-matter eligibility upon the claimed abstract invention.[67] Further, the court found that considering these components as a whole rather than separately did not add anything further.[68] Based on the invention's failure to pass the second step of the *Mayo* framework, the Supreme Court found the invention to not be subject-matter eligible.[69]

2. PTO Guidance

The PTO has provided guidance for applicants for CI inventions following the *Alice* decision.[70] The guidance is based on the *Mayo* framework and in this respect closely follows the reasoning of the *Alice* decision. As shown in Fig. 1, below, the only difference from the *Mayo* framework as discussed in *Alice* is the additionally preliminary step of determining whether the claim being examined is directed to a "process, machine, manufacture, or composition of matter" as specified in 35 U.S.C. § 101. Based on this step, a claim directed to a transitory signal (e.g., an electronic or electromagnetic signal encoded with certain information), for example,

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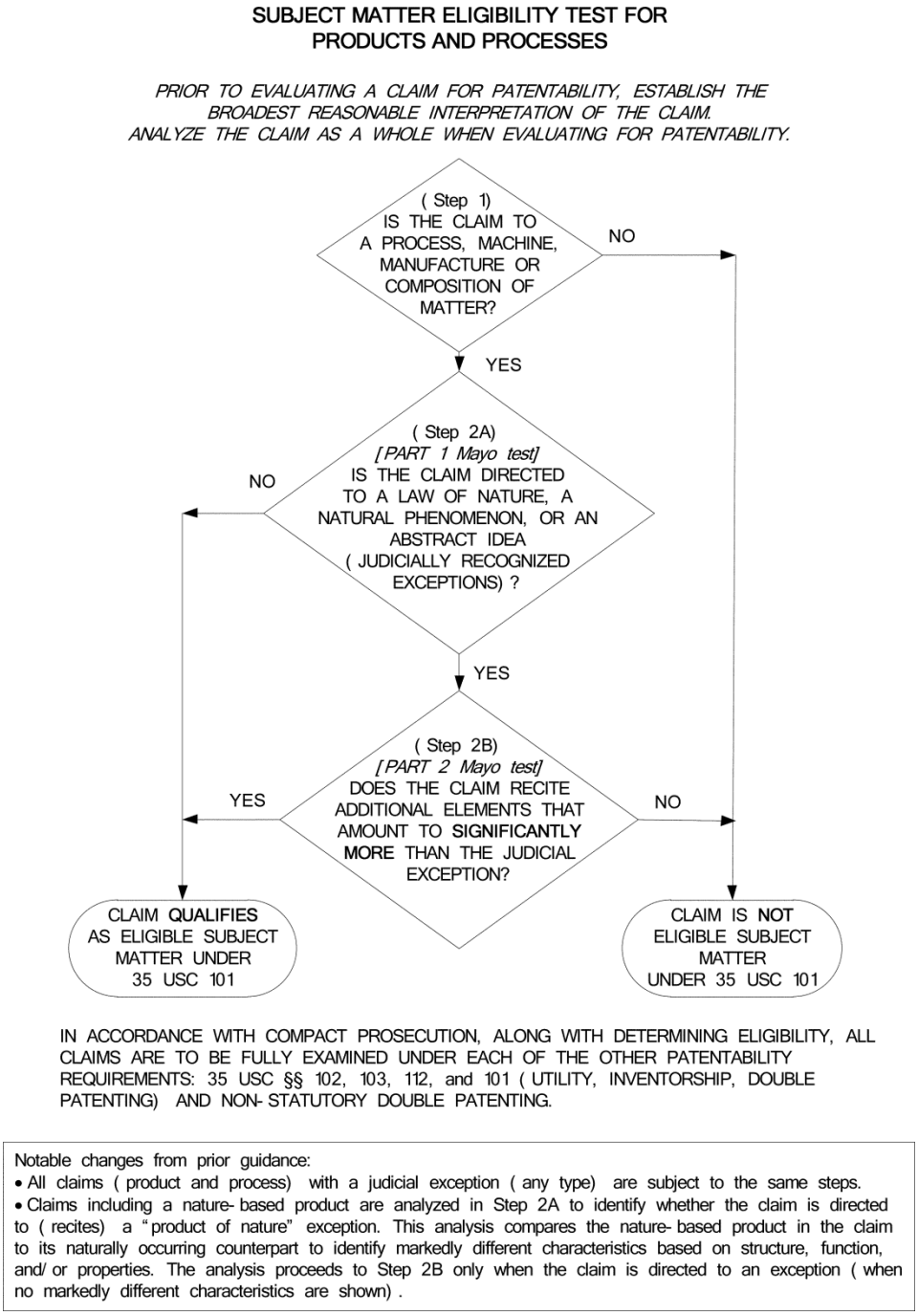
[62] *Id*. at 2357.
[63] *Id*. at 2358.
[64] *Id*.
[65] *Id*.
[66] *Id*. at 2359.
[67] *Id*.
[68] *Id*. at 2359-60.
[69] *Id*. at 2360.
[70] *2014 Interim Guidance on Patent Subject Matter Eligibility*, 79 Fed. Reg. 74,618 (PTO 2014) ("*Interim Guidance*"); *Examples: Abstract Ideas* (PTO January 27, 2015), *available at* http://www.uspto.gov/patents/law/exam/abstract_idea_examples.pdf ("*Examples*"); *July 2015 Update: Subject Matter Eligibility*, Appendix 1: Examples (PTO July 30, 2015), *available at* http://www.uspto.gov/patent/laws-and-regulations/examination-policy/2014-interim-guidance-subject-matter-eligibility-0 ("*Update*").

would not be subject-matter eligible, because it would not be covered by any of the categories articulated in Section 101.

In connection with the PTO's second step of determining whether the invention is directed to an abstract idea, the PTO guidance indicates that a PTO examiner should refer to "the body of case law precedent in order to identify abstract ideas by way of comparison to concepts already found to be abstract".[71] In particular, the guidance indicates that "a claimed concept [not be] identified as an abstract idea unless it is similar to at least one concept that the courts have identified as an abstract idea."[72] Accordingly, the guidance indicates that the following categories have been found to invoke abstract ideas:

- Fundamental (foundational) economic practices (e.g., inventions directed to agreements between people in the form of contracts, legal obligations and business relations);
- Certain methods of organizing human activity (e.g., managing relationships or transactions between people, social activities, human behaviour, satisfying or avoiding legal obligations, advertising, marketing and sales activities and managing human mental activity);
- An idea of itself (e.g., an idea standing alone, such as uninstantiated concepts, plans or schemes, mental processes that can be carried out in the human mind or by a human using paper and pencil, such as organizing information, data recognition, comparing and/or collecting information); and
- Mathematical relationships/formulas (e.g., mathematical algorithms, relationships, formulas, calculations, such as converting data from one numerical system to another, a formula for calculating an alarm limit, a formula for describing an electromagnetic wave, a mathematical formula for hedging, managing a life insurance policy by performing calculations, reducing the amount of calculations in known computations, determining the optimal number of visits by a business representative to a client, computing a price for the sale of a fixed income asset, calculating the difference between local and average data values).[73]

[71] *Update* at 3.
[72] *Id*.
[73] *Id.* at 4-5.



PTO Guidance Figure on Subject-Matter Eligibility[74]

The PTO guidance includes examples of application of its *Mayo* framework based on examples from case law as well as several hypothetical examples. For example, the PTO guidance includes the following (all of which were found to satisfy the PTO's first step of determining whether the claim recites a process, machine, manufacture, or composition of matter):

[74] *Interim Guidance* at 74,621.

Claimed Invention	Abstract idea?	Additional elements amounting to significantly more than the judicial exception?	Subject-Matter Eligible	Source of Example
Graphical User Interface Inventions				
A method claim of a graphical user interface invention in which the recited elements include: • monitoring the boundaries of two displayed windows, and • automatically relocating textual information in one of the windows upon detecting an overlap of the windows.[75]	No; "the claimed method is necessarily rooted in computer technology to overcome a problem specifically arising in graphical user interfaces	Not relevant	Yes	Hypothetical example
Same invention as above, but where the claim merely recites calculating a scaling factor (which presumably could be used to relocate and redraw one of the windows upon an overlap)[76]	Yes, because it is merely directed to mathematical algorithm	No, the body of the claim recites no additional limitations, and the preamble, which recites that the claimed process is used in a graphical user interface environment, only states a field of use limitation that does not limit the scope of the claim	No	Hypothetical example
Internet-Based Business Method Inventions				

[75] *Update* at Appendix 1, 7-12.
[76] *Id*.

Claimed Invention	Abstract idea?	Additional elements amounting to significantly more than the judicial exception?	Subject-Matter Eligible	Source of Example
A method directed to distributing stock quotes over a network in which: • stock quotes are received at a server, • the stock quotes are filtered by comparing to user-specified values, • a stock-quote alert is generated based on the filtering, and • a stock quote is transmitted to the subscriber's computer.[77]	Yes, because the steps involve merely the organization and comparison of data which can be performed mentally and is an idea of itself	No, the server is recited at a high level of generality and most broadly only requires a generic computer carrying out generic functions. Limitations directed to the Internet are simply a field of use limitation that is not sufficient. Viewed either individually or collectively, the limitations do not add anything "significantly more".	No	*Google, Inc. v. Simpleair*, Inc., CBM Case no. CBM 2014-00170 (Jan. 22, 2015)
Same invention as above, but where the claim also recites: • transmission of the alert wirelessly to the subscriber's wireless device, • displaying the alert on the wireless device, and • enabling connection to the data source over the Internet when the wireless device	Yes, for the reason set forth above.	Yes, because when the following additional limitations are considered as a whole: • using a microprocessor and memory, • transmission of data over a data channel to a wireless device, • displaying the alert, and • connecting the subscriber to the data source over the Internet, the invention is significantly more than simply organizing and comparing data. The invention addresses the Internet-	Yes	*Google, Inc. v. Simpleair*, Inc., CBM Case no. CBM 2014-00170 (Jan. 22, 2015)

[77] *Id*. at Appendix 1, 1-5.

Claimed Invention	Abstract idea?	Additional elements amounting to significantly more than the judicial exception?	Subject-Matter Eligible	Source of Example
becomes locally connected to the subscriber's computer.[78]		centric challenge of alerting a subscriber with time sensitive information when the subscriber's computer is offline.		
The invention is directed to solve the problem of an Internet user being directed away from a host web page when the user clicks on an ad displayed on the host web page. In the invention, when the user clicks on the ad, the user is serve a web page that is a composite of the host web page and the ad web page. The user, in this way, is served the desired ad-related information in a manner that retains the look and feel of the host's web page. The relevant claim recites a computer system that includes a computer store and computer serve that carry out	No, because the claim does not recite any of a mathematical algorithm, fundamental economic or longstanding commercial practice, and instead addresses an Internet-centric business challenge of retaining website visitors. The invention is necessarily rooted in computer technology in order to overcome a problem specifically arising in the realm of computer networks. No idea similar to those previously found	Not relevant	Yes	*DDR Holdings, LLC v. Hotels.com, L.P.*, 773 F.3d 1245 (Fed. Cir. 2014)

[78] *Id*.

Claimed Invention	Abstract idea?	Additional elements amounting to significantly more than the judicial exception?	Subject-Matter Eligible	Source of Example
steps implementing this functionality.[79]	by the courts to be abstract has been identified in the claim.			

[79] *Examples* at 4-6.

Regarding the third step – relating to determining whether the claim recites additional elements that amount to significantly more than the judicial exception – the PTO guidance similarly does not set forth a methodology for the determination, but rather provides examples of when a finding of "significantly more" may be made:

- Improvements to another technology or technical field (e.g., a mathematical formula applied in a process for curing rubber);
- Improvements to the function of the computer itself (e.g., reducing memory usage, faster computation time etc.);
- Applying the judicial exception with or by a particular machine (i.e., other than a generic computer);
- Transforming or reducing an article to a different state or thing (e.g., transforming raw rubber into cured rubber using a mathematical algorithm to control the curing process);
- Adding a specific limitation other than what is well-understood, routine and conventional in the field, or adding unconventional steps that confine the claim to particular useful application; and
- Other meaningful limitations beyond generally linking the use of the judicial exception to a particular technological environment.[80]

On the other hand, the PTO guidance indicates that the following do not allow a finding of the presence of "significantly more" than a judicial exception:

- Merely applying the judicial exception, or mere instructions to implement an abstract idea on a computer;
- Simply including well-understood and routine, conventional activities previously known to industry at a high level of generality (e.g., using a generic computer to obtain data, adjust account balances, issue automated instructions);
- Adding insignificant extrasolution activity to the judicial exception (e.g., adding a data-gathering step, or an ordinary input/output step); and
- Merely narrowing the use of the judicial exception to a particular technological environment or field of use (e.g., claim elements limiting the use of the abstract idea of hedging to the commodities or energy markets).[81]

3. Comparison of the Subject-Matter Eligibility Requirements for Patentability in EPO law and in the U.S.

The procedures for determining subject-matter eligibility in the EPO and in the U.S. are formally different. Generally speaking, the EPO's initial threshold for determining subject-matter eligibility for CI inventions is relatively low.

[80] *Interim Guidance* at 74,624.
[81] *Id*.

However, as discussed above, the subject-matter eligibility inquiry has been partially offloaded into the inventive step inquiry through the EPO Technical Board of Appeal-developed rule that non-technical features do not contribute to inventive step.[82] This rule requires that inventive step can only be found based on the technical features of the invention.

Generally, however, determining whether a feature is technical or non-technical is difficult and involves legal uncertainty. For example, different panels of the EPO's Technical Board of Appeal have vacillated regarding whether a particular feature was technical or not. For example, the Technical Board of Appeal in one decision found that the presentation of information on a display that improves readability of displayed content is technical.[83] However, more recently, the Technical Board of Appeal has found that this is not technical.[84] Thus, the EPO's methodology for determining subject eligibility for CI inventions involves legal uncertainty.

In the U.S., the *Alice*-based subject-matter eligibility criterion requires a determination of whether the claim is directed to an abstract method. Although the U.S. PTO's guidance indicates that this may be done based on prior decisions of courts finding various concepts to be abstract, in practice, predicting whether a particular claim is directed to an abstract idea is not straight-forward and involves a great deal of legal uncertainty. After all, a patent claim at some level relates to a particular functionality that is desired and is carried out by the device or process recited in the patent claim. That functionality may be characterized at differing levels of abstraction. For example, a claim directed to compressing video data according to a particular embodiment to minimize the bandwidth cost and transmission time of video data could be characterized by any of the following levels of abstraction:

- transmission of data,
- transmission of compressed data,
- transmission of video data, or
- transmission of compressed video data using the particular algorithm.

Arguably, the first three characterizations above articulate abstract subject matter; whereas it is not clear whether or not the last characterization, in which the functionality underlying the claim has been stated most granularly, relates to an abstract idea. Given the absence of useful, practical guidelines in determining how to determine whether a claim is directed to an abstract idea, this step of the *Alice*-based subject matter eligibility inquiry is fraught with difficulty and legal uncertainty.

The next step in the *Alice*-based subject matter eligibility inquiry is determining whether the claims recite additional elements that amount to significantly more than the judicial exception. This inquiry has some parallel to the EPO's rule of discounting non-technical features in determining inventive step. However, this step, unlike the EPO's methodology, is not anchored to any

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[82] *Hitachi*.
[83] *T 0049/04 (Text Processor/WALKER)*, (EPO Bd. Appeal, Oct. 18, 2005), *available at* http://www.epo.org/law-practice/case-law-appeals/recent/t040049eu1.html.
[84] *T 1562/11 (Closing out white spa*ce/SAP*)*, (EPO Bd. Appeal, June 3, 2015*), available at* https://www.epo.org/law-practice/case-law-appeals/recent/t111562eu1.html.

formalism (like the problem-solution formalism of the EPO in assessing inventive step); essentially, the decision maker is forced to assess the non-abstract idea elements and somehow determine whether or not they are "significant". This step of the inquiry is also fraught with difficulty and legal uncertainty.

Based on consideration of the methodologies of determining subject-matter eligibility in the EPO and U.S., it is not possible to prima facie reach a conclusion regarding whether the EPO or the U.S. methodology is more liberal in its treatment of CI inventions.

In fact, neither methodology can be said to be more favourable than the other in allowing subject-matter eligibility across all contexts. For example, as discussed above, the EPO methodology provides that express recitation of the use of a computer, a computer network or a computer-readable storage medium confers technical character on the invention, and the invention is not excluded from patentability for subject-matter eligibility reasons.[85] (As discussed above, however, part of the inquiry is offloaded into the inventive step inquiry, in which the EPO finds that non-technical features of the invention do not contribute to inventive step.) However, in the U.S., elements of a claim relating to implementation by a generic computer do not result in a finding that the claim recites additional elements that amount to significantly more than the judicial exception.[86]

Similarly, there are some classes of inventions which would likely be found subject-matter ineligible in the U.S., but which have been found to be subject-matter eligible under EPO law. For example, it is likely that a claim directed to a computer-readable data structure (with no significant additional limitations) would be found subject-matter ineligible in the US, given that a data structure is an abstract construct. However, the EPO has found that under certain circumstances, a data structure may have technical character and thus be subject-matter eligible.[87] Additionally, a claim directed to an electromagnetic signal carrying computer-readable instructions for performing a method has been found based on pre-*Alice* case law to not be subject-matter eligible, whereas the EPO has found such claims subject-matter eligible.[88]

The above examples suggest that there are at least some CI inventions implemented on generic computers that are subject-matter eligible in the EPO but not in the U.S. However, there are contexts in which the reverse holds. For example, in the context of graphical user interfaces, recent decisions of the EPO have found that the presentation of information on a display that improves readability of displayed content is not technical, and thus cannot contribute to

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[85] *See, e.g.*, *G-3/08, Programs for Computers*, [2010] O.J.E.P.O 17, (EPO Enlarged Bd. Appeal, May 12, 2010), *available at* http://documents.epo.org/projects/babylon/eponet.nsf/0/DC6171F182D8B65AC125772100426656/$File/G3_08_Opinion_12_05_2010_en.pdf; *Guidelines for Examination in the European Patent Office, Part G, EPO Guidelines for Patentability* (Nov. 2015)

[86] *Alice* at 2358.

[87] *T 1194/97 (Data structure product/PHILIPS)*, (EPO Bd. Appeal, March 15, 2000), *available at* https://www.epo.org/law-practice/case-law-appeals/recent/t971194ex1.html.

[88] *In re Nuijten*, 500 F.3d 1346 (Fed. Cir. 2007); *T 0163/85 (Colour television signal)*, (EPO Bd. Appeal, March 14, 1989), *available at https://www.epo.org/law-practice/case-law-appeals/recent/t850163ep1.html*.

inventive step.[89] However, in the U.S., graphical user interface inventions, such as automatically relocating textual information in a window upon obscuring of the textual information by another window, may be subject-matter eligible and patentable.[90] Thus, in this context, the U.S. methodology appears to be more liberal in finding certain inventions directed to displaying information subject-matter eligible.

In conclusion, although the EPO's methodology at least provides a more definite formalism, both the EPO and U.S. methodologies for determining subject-matter eligibility involve legal uncertainty and present difficulties for practitioners, applicant and patent holders. Additionally, it cannot be said that one or the other methodology is more liberal in finding CI inventions to be subject-matter eligible across all contexts.

III. Disputes Over Cloud Computing Patents and the Impact of Subject-Matter Eligibility Criteria

A. Definition and Characteristics of Cloud Computing Technologies

The term "cloud computing" refers to a variety of differing technologies that share some overall commonalities. As defined by the U.S. National Institute of Standards and Technology ("NIST"), cloud computing is "a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction."[91] The NIST report lists the essential characteristics of cloud computing technologies:

On-demand self-service. This characteristic refers to a consumer's ability to unilaterally provision cloud computing capabilities, such as server time and network storage, as needed automatically and with minimal human input.

Broad network access. This characteristic refers to providing access over the network to cloud computing capabilities for a multitude of user client platforms, such as mobile phones, tablets, laptops, and workstations.

Resource pooling. This characteristic refers to the pooling of computing resources (such as storage, processing, memory and transmission bandwidth) to serve multiple consumers by dynamically (and in real-time) assigning the resources required for each consumer based on consumer demand. The services are virtualized, in the sense that they are provided and implemented at a higher layer of functionality in a way that provides independence from lower layer infrastructure, such as hardware. In this way, the consumer is not aware of (and has no need to be aware of) how the cloud computing services are actually implemented.

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[89] *T 1562/11 (Closing out white spa*ce/SAP*)*, (EPO Bd. Appeal, June 3, 2015*), available at* https://www.epo.org/law-practice/case-law-appeals/recent/t111562eu1.html.
[90] *Update* at Appendix 1, 7-12.
[91] *See* NIST Definition, *supra* note 19.

Rapid elasticity. This characteristic refers to the ability to elastically provision and release resources, such as, for example, the amount and size of data supported by an application, the number of concurrent users etc. in a way that scales rapidly outward and/or inward in accordance with demand. To the consumer, the capabilities available for provisioning often appear to be unlimited and can be accessed in any quantity at any time.

Measured service. This characteristic refers to measuring usage of a cloud computing resource accurately and reporting the measurements in way that provides transparency for both the provider and consumer of the cloud computing service.[92]

The NIST definition of cloud computing is consistent with other generally accepted definitions. For example, ISO/IEC 17788:2014 (entitled "Information technology — Cloud computing — Overview and vocabulary", first edition, October 15, 2014) ("ISO 17788") provides the following definition: "[c]loud computing is a paradigm for enabling network access to a scalable and elastic pool of shareable physical or virtual resources with self-service provisioning and administration on-demand." ISO17788 further provides that key characteristics of cloud computing include broad network access, measured service, multi-tenancy (i.e., the physical or virtual resources are allocated in such a way that multiple tenants, or users, and their computations and data are isolated from and inaccessible to one another), on-demand self-service, rapid elasticity and scalability and resource pooling.

As discussed earlier, most, or possibly nearly all, cloud computing inventions are CI inventions, because they necessarily involve one or more networked computers. For example, cloud computing applications requiring a human interface, for example, through a screen requiring human input, may incorporate graphical user interface inventions, which are a type of CI invention. A cloud computing application directed to transmission of video streaming services to consumers may incorporate image processing inventions, again a type of CI invention, to provide seamless and high-quality service. Similarly, a cloud computing application that is directed to ensuring synchronization of database data belonging to a multinational company with many international offices and many servers located around the world may incorporate data transmission inventions (e.g., directed to compressing data through bandwidth limited channels to maximize transmission and synchronization speed), which are again a type of CI invention. For this reason, a study of the patentability of cloud computing inventions is necessarily the study of the patentability of CI inventions in a specific area of high current commercial interest.

[92] *Id*.

B. Why Study Patent Eligibility for Cloud Computing CI Inventions?

Development of a strong cloud computing industry is generally perceived to be desirable because cloud computing (i) "feeds the innovation ecosystem by lowering the bar or new entrants and facilitating experimentation"; (ii) is a production platform and toolset for providing the building blocks for the creation of new systems, and (iii) provides a marketplace with global reach that can be accessed by apps for smartphones, tablets and browsers by anyone anywhere with an Internet connection.[93] Europe appears to be behind the U.S. in developing a strong and sustainable cloud computing industry, and is in danger of falling further behind.[94] Patent policy, and in particular, the rules for patent eligibility of CI inventions, may be a tool in attempting to bridge the gap with the U.S. by encouraging further innovation and risk-taking in this industry. On the other hand, setting the patent eligibility threshold too low could be counterproductive and could harm the development and deployment of new cloud computing technologies. For that reason, an exploration of the current state of play of the patentability of CI inventions in cloud computing in Europe and the U.S. may be helpful in identifying patent policies that encourage, and not hinder, the further development of cloud computing technologies in Europe.

C. Patentability of Cloud Computing Inventions in EPO Law and in the U.S.

Because cloud computing at the highest level of generality invokes computing, cloud computing technologies are implemented using computational resources, such as computer hardware and software, and for that reason, most, and possibly all, cloud computing inventions are CI inventions. In this sense, given the subject-matter eligibility rules for CI inventions in EPO law and in the U.S., it is important to consider the subject-matter eligibility, and more broadly, the patentability, of inventions directed to cloud computing inventions.

Given the diverse set of technologies implicated by cloud computing, it is difficult to make generalizations regarding the subject-matter eligibility and patentability of these inventions. However, as discussed earlier, cloud computing services are generally "virtualized" – i.e., such services are provided and implemented at a higher layer of functionality providing independence from lower layer infrastructure, such as hardware. Additionally, many aspects of cloud computing as discussed above, such as the essential characteristics of network access, resource pooling, rapid elasticity and measured service, appear to relate at least in part to notions of administration of resources rather than implementation of novel hardware resources. Because of the at-most indirect nexus to hardware, we would expect that many cloud computing inventions on average pose a higher risk (for example, compared to other CI inventions) that

[93] J. Zysman et al., *The Implications of Cloud for Integrated Research and Innovation Strategy*, European Commission, Directorate-General of Communications Networks, Content & Technology (2014) at 8.
[94] *Id.*

they might be found abstract and not subject-matter eligible. On the other hand, we would also expect, at least in some cases, that implementation of such features might invoke novel hardware, or novel configurations of hardware. For these reasons, it is hard to ascertain a-priori whether cloud computing inventions as a class are more vulnerable to subject-matter eligibility challenges compared to other CI inventions.

1. Comparison of EPO and U.S. Cloud Computing Patents and Disputes

To determine and compare the degree of patentability of cloud computing inventions in each of the EPO and the U.S., the authors considered a set of cloud-computing-related patent disputes and then studied various patentability-related statistics in the EPO and the U.S. Based on a legal news publication that tracks patent litigations and disputes in the U.S., we initially determined a set of patent disputes in the cloud-computing areas that led to legal action in the U.S. (i.e., a complaint in court, or the filing of a post-grant challenge to a patent at the U.S. PTO). Because these disputes led to patent-related U.S. court or PTO challenges to the patents, these patents are likely of some commercial importance, in that they cover or potentially cover commercially successful products or services (because patentees and/or challengers would not ordinarily pursue legal action with respect to patents that were not thought to cover commercially useful products or services.)

We then used patent databases to determine information relating to the relevant patents, such as whether there were any existing European patents that were family members[95] and whether there were any subject-matter eligibility based challenges in the U.S. based on *Alice*. We summarize and discuss our findings below.

European patents are filed less frequently on cloud computing technologies than in the U.S. Out of the 21 patent families corresponding to the set of patent disputes that were covered (with each patent family including at least one U.S. patent), only 11 of the patent families contained at least one European patent application (or a national patent application of a member state of the EPO). Thus, in almost half the relevant cloud computing patent families, the applicants did not seek any protection in Europe. An explanation for this could include a diverse set of factors, including the relative ease of enforcing patents in the U.S. compared to Europe (where currently individual patent suits must be brought in each of European jurisdictions where enforcement is sought), the greater patent damages available in the U.S. compared to Europe, the relative lack of corresponding commercial markets in Europe compared to the U.S., and perceived greater legal difficulties in Europe compared to the U.S., such as with respect to subject-matter eligibility criteria.

[95] The EPO defines a "patent family" as follows: "A patent family is a set of either patent applications or publications taken in multiple countries to protect a single invention by a common inventor(s) and then patented in more than one country. A first application is made in one country – the priority – and is then extended to other offices." *See, e.g.*, https://www.epo.org/searching-for-patents/helpful-resources/first-time-here/patent-families.html. Thus, a "patent family" comprises the set of applications and patents corresponding to a single invention in multiple jurisdictions.

Even when filed, European patent applications often do not lead to granted patents in the cloud computing technology area. Out of the 11 patent families that included at least one European patent application, only 7 included a granted European patent. This is in contrast to all 21 of the patent families including at least one U.S. patent. This suggests that the patentability standards under EPO law are stricter than those of the U.S. PTO in this technology area. It is possible that stricter patentability criteria in Europe are preventing the patenting of low-quality patents in this area. On the other hand, it is also possible in at least some cases that the stricter EPO standards are preventing the grant of important cloud-computing patents.

In cloud computing patent families including both European and U.S. patent applications, there are many more U.S. patents or applications compared to European patents or applications. Out of the 21 patent families considered in the cloud computing area, 16 families included two or more U.S. patent applications. However, only two families included more than one European patent or patent application. This indicates that applicants in the cloud computing technology area, even when they decide to file both European and U.S. patent applications, file much fewer European applications than U.S. patent applications. This may be partially explained by a fee structure for follow-on divisional applications in Europe that render it increasingly expensive to file consecutive divisional applications. However, it may also be explained by the perception among applicants that obtaining additional European patents has less utility than obtaining additional U.S. patents.

In this connection, the presence of a greater number of patents in a jurisdiction covering similar inventions is more favourable to the patentee (compared to an alleged infringer of those patents), because the patentee will ordinarily be able to assert a greater number of patents and claims against the alleged infringer, and the alleged infringer will have a more challenging task of showing non-infringement or invalidity of a greater number of patents and claims rather than a fewer number. Thus, the greater number of U.S. patents per family compared to European patents likely leads to a more favourable situation for cloud-computing patentees in the U.S. compared to Europe.

New U.S. post-grant procedures for challenging the validity of patents are being frequently used in the cloud computing area. In 2012 and 2013, pursuant to a new patent law in the U.S., the number of options for post-grant challenges to the validity of patents was increased. These new post-grant procedures have been used with increasing frequency, because they have frequently led to invalidity decisions. Additionally, these procedures are ordinarily a much cheaper route for challenging the validity of a patent compared to court litigation in the U.S.

In our study of the relevant cloud-computing patents, we found that one of these new post-grant procedures was used to challenge at least one U.S. patent in ten out of 21 of the patent families of the study. This suggests that challengers of cloud computing patents are using the new post-grant procedures in the U.S. as much as challengers in other technology areas.

The subject-matter eligibility of cloud computing patents is increasingly being challenged in the U.S. based on *Alice*. In our study of cloud-computing patents, we found that an *Alice*-based challenge to the subject matter eligibility of a patent had been made in seven out of the 21 patent families of our study. This is in line with expectations that post-*Alice*, patents

and applications granted to CI patents would be increasingly challenged based on subject-matter eligibility; this seems to be the case also for cloud-computing patents.

We further found in our data set that three out of these seven *Alice*-based challenges had already succeeded, one had not succeeded, and two were still pending. This success rate is not surprising, given that cloud-computing patents often are directed to virtualized mid- or high-layer software functionality that usually does not have a direct nexus to physical hardware, and is more likely to implicate abstractions.

2. Example Cases of Treatment of Cloud Computing Patents in the EPO and the U.S.

It is illustrative to consider how subject-matter eligibility considerations were taken into account in illustrative cases in the EPO and in the US.

<u>EPO Example</u>

European patent application EP1287476, entitled "Web-Based Groupware System" is a currently pending application that claims priority to a U.S. application that was filed in 2000. The invention is directed, at a relatively high level of abstraction, to a network-based collaborative workspace for sharing information. The set of claims filed in EP1287476 on July 6, 2007 included the following independent claim:

> *1. A system for providing collaborative workspace for sharing information, comprising:*
> *(i) a network-connected server capable of receiving an initiate instruction from a primary user, said server for maintaining a hierarchy between said primary user and at least one secondary user;*
> *(ii) a site builder for creating a dedicated site on said server in response to said initiate instruction;*
> *(iii) a transmitter for sending information about the existence of said dedicated site to said at least one secondary user nominated by said primary user;*
> *(iv) a compliance filter for detecting if the shared information is to be approved before transmission of the shared information to said at least one secondary user;*
> *(v) a communicator for transmitting said shared information (a) between said dedicated site and said primary user and (b) between said dedicated site and said at least one secondary user,*
> *(vi) memory for storing said shared information at said dedicated site, said shared information from said primary and said at least one secondary user; and*
> *(vii) a processor for processing said stored information, said processed information being transmitted by said communicator to said primary user and said at least one secondary user.*

The EPO examination report dated September 24, 2010 rejected this claim (as well as other claims of the application) for, among other reasons, lack of

inventive step. The examination report, in comparing the elements of the claim against the applied prior art, indicated that the feature of maintaining a hierarchy is functional and derives directly from (non-technical) administrative considerations. The examination report further stated that:

> *There are no technical details of implementation of the workflow for sending and reviewing documents, and the claims and the application more generally are rather concerted with the description of the administrative roles and functions to be performed than discussing technical issues of implementation . . . [the claimed invention even if clarified] would not satisfy the requirements of [inventive step] as a combination of commonly known technical features aiming to achieve a mere automation of administrative steps is not considered to meet the requirements of [inventive step] under the current case law.*

Thus, consistent with the description above of the methodology for determining inventive step in the EPO, the EPO in this case took the view that various non-technical features of the claim are not taken into account in considering inventive step, and therefore rejected the claim.

In a response filed on January 24, 2011, the applicant argued, among other things, that various features of the claim were directed to quickly and efficiently selecting information for forwarding to clients, and that for that reason the claim is directed to solving the problem of inefficient and wasteful resources. The EPO has not yet responded to this communication.

U.S. Example

Appistry, Inc. sued Amazon.com, Inc. in the U.S. District Court for the Western District of Washington for infringement of U.S. patents 8,200,746 ("the '746 patent") and 8,341,209. The asserted patents are directed to "transactional processing using multiple networked computing systems; and more particularly . . . to processing information using a hive of computing engines, typically including request handlers and process handlers." '746 patent, 1:15-22. Claim 1 of the '746 patent is illustrative:

> *1. A system for processing information, the system comprising:*
> *a plurality of networked hive engines, a plurality of the hive engines being grouped into a plurality of territories;*
>
> *wherein at least one of the hive engines is configured to receive a service request for a processing job, the processing job comprising a plurality of processing tasks for execution by a plurality of hive engines within at least one territory;*
>
> *wherein a plurality of the hive engines within the at least one territory are configured to perform the processing job in a distributed manner such that the processing tasks of the processing job are distributed to a plurality of hive engines within the at least one territory for execution thereby; and*

wherein the plurality of hive engines within the at least one territory that execute the processing tasks are further configured to return state information corresponding to the processing tasks for delivery of a processing result in response to the service request.

Amazon.com, Inc. filed a Motion for Judgment on the Pleadings asserting the claims of the patents were not valid because they were not subject-matter eligible. Following the *Alice* framework, the court initially found that the claims were directed to the abstract idea of "distributed processing akin to the military's command and control system, a longstanding and intuitive practice used by many large hierarchical organizations that value speed, efficiency, reliability and accountability." The court further stated that:

> *The patents describe systems and methods of using a network of multiple actors to efficiently and reliably process information and/or complete a task by breaking down the job into small pieces, each handled by a different actor organized within an internal hierarchy. That the inventions describe this idea as implemented by computers or as solely existing in the computer realm, and thus that the inventions have no pre-computing analogues, does not "take[] the claims outside the realm of the abstract" as Appistry contends . . . . Rather, it highlights the fact that the patents claim an abstract idea implemented in a particular technological environment: a "fabric" of inexpensive networked computers.*[96]

Applying the next step in the *Alice* methodology, the court found that consideration of additional elements did not save the claim. In particular, the court found that "the claims at issue do no more than simply instruct the practitioner to implement the abstract idea of distributed processing akin to command and control on generic computers, connected through generic networks. The claims' invocation of computers adds no inventive concept because the functions performed by the computers at each step of the process are well-understood, routine, and purely conventional."[97] The court found that the limitations of the claims merely limit the abstract idea of distributed processing akin to command and control to a particular technological environment, namely networked computers.[98]

Based on these findings, the court found that the asserted patents were invalid for not being subject-matter eligible.

IV. Patent Policy Implications and Next Steps

[96] *Appistry, Inc. v. Amazon.com Inc*., No. C15-311 MJP (W.D. Wash. July 9, 2015) (Order Granting Defendants' Motion for Judgment on the Pleadings).
[97] *Id.* at 7.
[98] *Id*. at 9.

The present report aims to summarize the state of the law on CI inventions in Europe (based on the rules and practice of the EPO) and in the U.S. A thorough review of the economic effects and of the policy implications of the existing state of patent law for CI inventions is outside the scope of the commissioned study. However, some policy-related inferences may be made, taking into account the 2008 Commission Report and recent patent law developments, in particular the recent developments in the U.S. concerning patents to CI inventions and developments in Europe, including European patent law developments that are not limited to the area of CI inventions. Further studies would be required to better assess what policy measures could be taken.

A. Policy Implications Relating to the Software Industry

***There appears to be no direct link between the patent rules and the development of the European software and Internet industry*.** The 2008 Commission Report was sceptical at best regarding any positive economic consequences of the patentability of CI inventions. There is no new evidence to the contrary. Thus the benefits of granting patents for CI inventions are far from obvious. At the same time, there is also no evidence indicating that the existing practice of the EPO, or a possibly more liberal regime of more easily granting patents to CI inventions, is harmful to the advancement of the software industry. For example, the possibility of obtaining patents on CI inventions in Europe has apparently not hampered the development of the European open-source software industry. However, unlike the U.S., market-leading, large software and Internet companies have not developed in Europe over the last two decades. In this connection, it is generally perceived that the European software and Internet industry, either at the scale of large, leading companies, or at the scale of SMEs, is not as dynamic and vibrant as that of the U.S. SAP, Sage and Dassault Systems appear to be the largest leading European software companies, but they are nevertheless small in comparison with their market-leading U.S. counterparts. In the field of Internet services, where a business-friendly software environment is decisive for growth, there is no equivalent to the GAFAM companies (i.e., Google, Amazon, Facebook, Apple and Microsoft). In particular nearly all European providers of cloud services, with the possible exception of SAP, remain modest in comparison with Salesforce, Amazon Web Services and Microsoft. However, there is no evidence so far linking this state of affairs to differing standards of patent eligibility for CI inventions in Europe and the U.S.

The revised patent rules for CI inventions in the U.S. will probably not affect the growth of the U.S. software and Internet industry. Given the recent *Alice*-based change in U.S. law toward a stricter regime of patent eligibility for CI inventions, it will be interesting to observe whether this change has an eventual negative impact on the growth of the software and Internet industry in the U.S. Any observable effects such as a decline of the growth rate of that industry may be seen as indicators that a less-strict regime of patent eligibility may actually be helpful in development and growth of the software industry. However, we believe that the legal framework and in particular the intellectual property rules may not be the decisive factor for explaining the decline (or the growth) of an industry. Many other factors, such as the broad availability of venture-capital, a favourable regulatory regime for business, and the existence of a strong industrial ecosystem with a highly qualified and mobile

workforce (such as is present for Internet-related businesses in Silicon Valley), may play a greater role in the economic decline or growth of an industry.

There has been a generally negative reaction to the *Alice*-based change of law in the U.S., and it is possible that legislation or further court decisions may further change this regime in the near future, possibly back in the direction of less strict patent eligibility criteria.[99] In that case, it may be difficult to observe a clear trend connecting the regime of patent eligibility criterion for CI inventions and software industry development and growth. In addition, a possible reduced growth rate of the U.S. software industry might be explained by other, more important, macro or micro-economic factors (such as a difficulty in financing growth due to systemic economic factors, or a decline in the availability of talented software developers.) As a result, it will likely be difficult to link the rules of patent eligibility for CI inventions with state of the software and computer industry.

Companies tend not to patent cloud computing technologies in Europe as much as they do in the U.S. The empirical study of cloud-computing patents and applications discussed above suggests that applicants for inventions relating to cloud computing technologies are less likely to file applications at the EPO compared to the U.S. PTO, are likely to file fewer EPO applications when they actually do so, and are likely to be less successful in obtaining a patent at the EPO. These may at least in part stem from a high threshold for patent eligibility for CI inventions in Europe. It may also stem in part from the currently fragmented nature of patent infringement litigation in Europe with its greater transaction costs, and the lower amounts of patent infringement damages awards available in Europe compared to the U.S., making the patenting of cloud computing technologies less attractive in Europe. Additionally, economic and strategic factors, such as the lead U.S.-based software companies had at the inception of the cloud computing business, and the absence of strong European competitors in certain segments of the market, might explain the low uptake of patents and applications on cloud computing technologies throughout Europe.

B. Policy Implications Deriving From the UPC System

In the mid to long term, the UPC system, if it comes into force, will likely affect European software and Internet companies to a greater degree than the rules for patentability of CI inventions. Because the UPC is a step towards a Europe-wide court system for patent enforcement, it is possible that its establishment will result in a perception that patents in Europe are of

[99] It is possible that lower courts will interpret the Supreme Court's *Alice* decision in a way that is less harsh than currently understood. In this connection, on May 12, 2016, the Court of Appeals for the Federal Circuit in the *Enfish* case found that an invention comprising an improved database that resulted in increased flexibility, faster search times, and smaller memory requirements was not an abstract idea, even though these improvements were not defined by reference to any physical components. *Enfish, LLC v. Microsoft Corp.*, 2016 WL 2756255 (Fed. Cir. 2016) ("Enfish"). In particular, the fact that these improvements arose from logical structures and processes in software did not necessarily mean that the invention was unpatentably abstract. *Id*. In so deciding, the court indicated that *Alice* had suggested that the abstract idea exception did not apply to claims purporting to improve the functioning of the computer itself, or improving an existing technological process. *Id*. It remains to be seen whether the *Enfish* decision leads to an interpretation of the *Alice* decision that has permanence.

higher value than they are at this point in time. Further, the reduction of the costs for enforcing patents and the development of a more harmonised European patent law could further enhance this effect.

The success of the UPC system is not assured (even its coming into existence could be jeopardized in case of a Brexit.) Further, it will likely take a long period of time, possibly on a scale of 10-15 years, before any measurable impact of the UPC can be observed, given the transitional period built into the UPC. For that reason, the UPC is unlikely to have any impact in the short term on specific CI invention areas, like the cloud computing technology area. But, if it is successful, we believe it will likely have a greater impact than the policies relating to patentability of CI inventions. Success will primarily depend on the number of patent holders opting for a European patent with unitary effect and on the number of patent holders *not* opting out from the exclusive jurisdiction of the UPC for their European patents that do not have unitary effect. Additionally, the attractiveness of the UPC for patent holders will likely depend on whether UPC judges take a pro-patent approach. At least initially, there may be pressure on the UPC to gain traction as a patent dispute-resolution forum and a consequent tendency to rule in favour of patent holders, for instance, by automatically or at least easily granting injunctions following a finding of patent infringement. This might have far-reaching effects in all technological fields, and in particular, in the software field.

In addition, the increased leverage linked to the possibility of obtaining injunctions and other patent-related relief for the whole UPC territory (at a minimum 13 EU Member States, including the three largest) will incentivize companies to assert their patents. As a result, non-practicing entity ("NPE"), and in particular, patent assertion entity ("PAE"), activity in Europe could thus increase.[100] This could lead to increased patent troll activity, in particular in the software field.

Academics have long raised their concerns about the possibility of patent troll activity in Europe in connection with the impending UPC system.[101] Some studies recently conducted for the European Commission express the same concerns.[102] Even industry, and in particular, the large U.S. software and

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[100] The term "non-practicing entity" refers to the companies holding patents, but which are not involved in the manufacturing of products or the provision of services. *See e.g.*, P. Belleflamme and A. Strowel, *Innovation Under Threat? Some Economic and Legal Considerations on the Patent Wars and Trolls*, in A. Autenne, V. Cassiers et A. Strowel (eds.), Liber Amicorum B. Remiche, Larcier (2014) at 337-352; *see also* S. Utku, *The Near Certainty of Patent Assertion Entity Victory in Portfolio Patent Litigation*, 19 J. TECH. L. & POL'Y 1-40 (2014) at 1, *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2384932.

[101] *See, e.g.*, B.J. Love et al., *Patent Assertion Entities in Europe,* Patent Assertion Entities and Competition Policy, D. Sokol (ed.), Cambridge University Press (forthcoming 2016), *available at* http://ssrn.com/abstract=2689350; C. Helmers et al., *Is There a Patent Troll Problem in the UK?*, 24 Fordham Intell. Prop., Media & Ent. L. J. (2014); *see also* A. Strowel, *The risk of patent trolls in the U.S. and in Europe: A sequel to a never ending story*, *available at* http://www.ipdigit.eu/2014/11/the-risk-of-patent-trolls-in-the-u-s-and-in-europe-a-sequel-to-a-never-ending-story/.

[102] C. Pentheroudakis, *Innovation in the European Single Market: The Role of Patents*, JRC Science and Policy Report, Thematic Report on the Brussels Conference, 17 March 2015, European Commission (2015) at 16-17, *available at* http://publications.jrc.ec.europa.eu/repository/bitstream/JRC96728/jrc96728.pdf.

Internet companies (such as, among others, Apple, Google, Cisco and Microsoft) have expressly raised concerns regarding specific aspects of the UPC (for example, the standards for granting injunctions upon a finding of patent infringement, and the bifurcated system, similar to that of Germany's, in which infringement and validity-related disputes are considered independently.)[103] The analysis of the risks associated with increased patent litigation in the software sector goes beyond the scope of this study. In any case, the impact the UPC system will have on the software and cloud computing sectors is likely to be more significant than that of the rules for eligibility of patents to CI inventions.

C. Further Studies for Assessing Possible Policy Measures

Potential steps in further exploring any link between the development of the software industry (e.g., further development of the cloud computing technology industry) and either of the patent eligibility requirements or the changes in the European patent framework include:

- A more detailed study of cloud computing patents and applications in Europe and the U.S. that takes into account infringement litigations in EU Member States;
- A technical investigation by qualified computer scientists of relevant cloud computing patents and applications used in the data set for the proposed study to determine technically and commercially high value patents and applications used in the study;
- A survey of companies filing both U.S. and European patent applications in the cloud computing area to determine why they emphasize the U.S. more than Europe;
- An analysis of the possible increase in patent litigation that will likely be triggered by the establishment of the UPC system, and the expected proliferation of patent assertion entity activity in the field of software and Internet technologies; and
- A review of available remedies for patent infringement in Europe with a view to developing policies to reduce the risk of abusive patent litigation in the software field and beyond.

V. Conclusion

We conclude with a summary of our review of the rules and practices regarding the patenting of CI inventions in Europe and the U.S.

The subject-matter eligibility criteria applied by the EPO and in the U.S. impose strict constraints on the patentability of CI inventions in these jurisdictions. There do not appear to have been significant changes to the EPO criteria over the last few years; by contrast, the interpretation and application of

[103] *See* the letter of a coalition of multinational technology companies *available at* http://www.scribd.com/doc/209104430/25-February-2014-UPC-Industry-Coalition-Open-Letter (Feb. 2014); *see also* the view of European companies *available at* http://www.industrycoalition.eu.

the U.S. criteria have significantly changed through and following the U.S. Supreme Court's *Alice* decision, rendering it more difficult to obtain and enforce patents directed to CI inventions in the U.S. However, both the EPO and U.S. methodologies for determining subject-matter eligibility involve legal uncertainty and present difficulties for practitioners, applicants and patent holders. Additionally, it cannot be concluded that, as of today, one or the other methodology is clearly more liberal in assessing the patent eligibility of CI inventions in all contexts.

Based on an empirical study of cloud-computing patents that have been asserted in litigation, we found that European patents are filed less frequently on cloud computing technologies than in the U.S. Even when filed, European patent applications often do not lead to granted patents in the cloud computing technology area. Consistent with this, in cloud computing patent families including both European and U.S. patent applications, there are many more U.S. patents and applications compared to European patents and applications.

Moreover, new U.S. post-grant procedures for challenging the validity of patents are being frequently used in the cloud computing area. The subject-matter eligibility of cloud computing patents is increasingly being challenged in the U.S. based on the U.S. Supreme Court's *Alice* decision.

European Commission

The trends and current practices in the area of patentability of computer implemented inventions within the EU and the U.S.

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