

From: Reinier Bakels [e-mail redacted]
Sent: Monday, September 27, 2010 7:51 AM
To: Bilski_Guidance
Cc: [e-mail redacted]
Subject: comments on the "Interim Bilski Guidance"

Dear Sirs,

Please find attached my comments on your "Interim Bilski Guidance".

As a European academic, I value the opportunity to give you my perspective from the other side of the Atlantic on the age-old problem of defining the limits of patentable subject-matter. In my research, I have compared patent law from various jurisdictions extensively, and I noted that American patent law actually is not as different from European patent law as often is assumed, at least as regards the subject-matter issue.

Hopefully you can benefit from my perceptions.

For your convenience, the attached PDF has been formatted for American "Letter" paper size.

With kind regards,

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Comments on the Interim Bilski Guidance 2010

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The author values the opportunity to share observations from his academic work on the comparison of American and European patent law – that actually have more in common than usually is assumed.

Introduction

Over the years, many attempts have been made to substantiate the exclusion of “abstract ideas” in American patent law, which is by itself undisputed. The proposed USPTO “Interim Guidelines” discuss factors weighing toward and against eligibility for patenting.

Among the attempts are the “Freeman-Walter-Abele test”¹ developed around 1980 for algorithm-related inventions, the criterion of a “useful, concrete and tangible result” of the 1990s,² and the recent “machine or transformation test”. None of these tests lived very long, at least as an exclusive test. No doubt, the recent rejection of the “machine or transformation test” (again: at least as a decisive test)³ has created a difficult situation – that might require an unusual solution.

Patent law in Europe fosters a limitation to “technological arts”, and some American writers believe that U.S. patent law should do the same.⁴ But all proposals to adopt such a criterion in American patent law were rejected,⁵ even if there is little doubt that the words “useful arts” in the Constitution⁶ are synonymous with “technological arts” in modern language.⁷ Another reason to be critical on a technology requirement is that it has been proven to be very difficult to make unambiguous and consistent rules to assess the technical content of patent applications in Europe.⁸ The problems occurring when distinguishing *abstract* patent applications in the U.S., and *non-technical* abstract patent applications in Europe are actually very similar, even in details.⁹ By default of a sufficient understanding of the economics of patents, rules are mostly based on a word-play.

¹ *After* In re Freeman, 573 F.2d 1237 (1978), In re Walter, 618 F.2d 758 (1980) and In re Abele, 684 F.2d 902 (1982).

² In re Alappat, 33 F.3d 1526, 1544 (1994).

³ Bilski v. Kappos 130 S.Ct. 3218, 3221 (2010).

⁴ *E.g.*, David J. Kappos, John R. Thomas & Randall J. Bluestone, *A Technological Contribution Requirement for Patentable Subject Matter: Supreme Court Precedent and Policy*, 6 NW. J. TECH. & INTELL. PROP. 2008, 152.

⁵ *Ex parte* Lundgren, 76 U.S.P.Q.2d (BNA) 1385, 2004 WL 3561262, 3.

⁶ Article I, section 8, Clause 8.

⁷ *See e.g.* In re Musgrave, 431 F.2d 882 (CCPA 1970).

⁸ *See* Reinier B. Bakels, *Should Only Technical Inventions be Patentable, Following the European Example?* 7 NW. J. TECH. & INTELL. PROP. 2008, 50.

⁹ *See* p. 8 *infra*.

Still, as we will explain below,¹⁰ there are economic clues for a rational substantiation of the “abstract ideas” exclusion, in the light of the U.S Constitution. But first we will discuss some interesting clues from case law from the time that the “abstract ideas” exclusion was developed, starting as early as the 19th century.

Legal Foundation

While in recent decades there has been much confusion about patenting algorithms¹¹ and business methods,¹² 19th and early 20th century case law actually shows a consistent line in the definition of “abstract ideas”. The principles developed in historic cases are sufficiently general to be applied in the 21st century.

In 1854, the Supreme Court decided that *Samuel Morse*, the inventor of the Morse code, could not also claim future applications of – what we would call nowadays – electronic data communication, because that would cause the patent to cover more than what Morse had actually invented, and block future developments.¹³ In this case, the Supreme Court referred to an British court decision that inspired the Court several times,¹⁴ about a patent on an improvement of the blast furnace.¹⁵ In order to make the distinction between a mere principle and a true invention, the British court posed the question whether “the inventor has given sufficient information to the public by which the invention can, on the expiration of the term for which the patent is granted, be brought into public use without experiments or expense”.¹⁶ The U.S. Supreme Court also referred to this British decision when it invalidated a patent on a certain *principle* to joint lead pipes, saying that: “a principle is not patentable. A principle, in the abstract, is a fundamental truth; an original cause; a motive; these cannot be patented, as no one can claim in either of them an exclusive right”.¹⁷ Similarly, mere ideas are not patentable, as became apparent when the U.S. Supreme Court decided that the idea to attach an india-rubber to the tip of a pencil was not patentable because “[a]n idea of itself is not patentable, but a new device by which it may be made practically useful is. The idea of this patentee was a good one, but his device to give it effect, though useful, was not new. Consequently he took nothing by his patent.”¹⁸ The difference between a abstract principle and a patentable invention was further clarified by the decision that a particular hydrolysis method for the production of glycerin from fats was patentable, because a *specific* solution was elaborated in detail, leaving other solutions free.¹⁹

An important decision from the last century about the difference between abstract ideas and patentable subject-matter notes that “[w]hile a scientific truth, or the

¹⁰ See “Economic Rationale”, p. 3.

¹¹ See *Gottschalk v. Benson*, 409 U.S. 63, 93 S.Ct. 253 (1972).

¹² See *State Street Bank & Trust Co. v. Signature Financial Group, Inc.*, 149 F.3d 1368 (1998).

¹³ See *O'Reilly v. Morse*, 56 U.S. 62 (1854).

¹⁴ *Le Roy v. Tatham*, 55 U.S. 156, 184 (1853).

¹⁵ See *Neilson v. Harford*, 151 E.R. 1266 (Court of Exchequer, 1841).

¹⁶ *Neilson v. Harford*, supra note Error: Reference source not found, at 1272.

¹⁷ *Le Roy v. Tatham*, 55 U.S. 156, 175 (1853).

¹⁸ *Rubber-Tip Pencil Company v. Howard*, 87 U.S. (20 Wall.) 498, 507 (1874).

¹⁹ *Tilghman v. Proctor*, 102 U.S. 707, 1880 WL 18737 (1880).

mathematical expression of it, is not [a] patentable invention, a novel and useful structure created with the aid of knowledge of scientific truth may be.”²⁰ Decisive is again whether an application has been elaborated, in this case a specific antenna. The application should really add something, as became apparent when the court decided that a certain breeding method was not patentable because it was a trivial application of a natural phenomenon. Although the phenomenon was not known before, patentability was denied because “[h]e who discovers a hitherto unknown phenomenon of nature has no claim to a monopoly of it which the law recognizes. If there is to be invention from such a discovery, it must come from the application of the law of nature to a new and useful end.”²¹ Again and again, the idea is the same: “a patent is not a hunting license”, as the Supreme Court once noted.²²

Indirectly, the statute itself indicates the difference between abstract ideas and a patentable subject-matter, by requiring a description enabling “any person having ordinary skill in the art” to apply the invention.²³ Courts²⁴ have added that the specification must enable a person skilled in the art to make and use the claimed invention “without undue experimentation”.²⁵ While the statutory requirement of a proper enabling disclosure²⁶ is part of Chapter 11 of the patent act entitled “Application for Patent” rather than Chapter 10 called “Patentability of Inventions”, indirectly it excludes subject-matter that *can not* be described in the required way, like abstract ideas and mere theories. Writers have made similar observations.²⁷

Incidentally, this does not mean that the subject-matter test (§ 101) is *replaced* by the enabling description requirement (§ 112). Section 112 retains its own role, because subject-matter that can be disclosed appropriately may still be insufficiently disclosed, as a matter of negligence.

Economic Rationale

According to the Constitution, the purpose of patents is “[t]o promote the progress of science and useful arts”.²⁸ Economists invariably presume that patents serve this purpose by giving a market power to patentees that they need to recoup R&D investments.

Still, this can't be generally true. Actually, neither the presence of investment is a reason to grant patents, nor is the absence of investment a reason not to do so, as

²⁰ Mackay Radio v. RCA, 306 U.S. 86, 94 (1939).

²¹ Funk v. Kalo, 333 U.S. 127, 130; 68 S. Ct. 440, 441; 92 L. Ed. 588, 592 (1948).

²² Brenner v. Manson, 383 U.S. 519, 536; 86 S.Ct. 1033, 1042 (1966).

²³ 35 USC § 112.

²⁴ For example, the disclosure was deemed sufficient in: *In re Wands*, 858 F.2d 731, 737 (1988), and insufficient in: *In re Wright*, 999 F.2d 1557, 1561-62 (1993).

²⁵ § 2164.01(a) ‘Undue Experimentation Factors’ in: United States Patent and Trademark Office, *Manual of Patent Examining Procedure*, 2008.

²⁶ http://www.uspto.gov/web/offices/pac/mpep/documents/2100_2164_01_a.htm.

²⁷ 35 USC § 112.

²⁸ See e.g. Brief of Amicus Curiae William Mitchell College of Law Intellectual Property Institute in support of the United State Patent & Trademark Office, *In re Bilski*, 2008 WL 1842269 (C.A.Fed.).

²⁸ Article I, section 8, Clause 8.

becomes apparent from the following observations. If investment would be a reason, then the results of basic science would be patentable too – but reality is that “laws of nature” and “natural phenomena” are not considered patentable subject-matter.²⁹ On the other hand, the Statute explicitly notes that “[p]atentability shall not be negated by the manner in which the invention was made”,³⁰ so coincidental and flash of genius inventions that do not require any substantial investment potentially still are patentable subject-matter. Another indication that investment is irrelevant is that only the first inventor gets a patent: a subsequent patent application for the same invention by another inventor who conceivably made similar investments independently will be rejected. Yet another indication is that the doctrine of equivalents extends patent protection beyond the actual invention – to other potentially competing products.

Patents are often said to prevent competitors from taking a “free ride”, parasiting on the investment of an inventor. Here we encounter a paradox: a core principle of a society fostering a market-based economy is that imitation is allowed to some extent, even if it hurts the competitor. “Creative destruction”³¹ is unavoidable for innovation. Innovations often are improved imitations. Patents are an exception that proves the rule of freedom of ideas.

Patents basically restrict competition. This effect seems conflicting with the common perception that competition should be unrestricted, because that is supposed to foster the interests of customers, by motivating suppliers to deliver the highest quality for the lowest price. If economists refer to “perfect competition”, they mean unrestricted competition.³² For suppliers though, “perfect competition” is undesirable, because eventually it will dissipate all profit.³³ Consequently, suppliers will try to escape from “perfect competition” by *differentiation*, providing exclusive features.³⁴ That leads to “monopolistic competition”, a market form where the interests of suppliers and consumers are more balanced.³⁵ This type of market typically offers substitutes to consumers, so they have a choice. But they will not necessarily choose the product with the lowest price, because the substitutes are “non-perfect”, due to differentiation. But they are still substitutes, so the supplier can only increase its price to a certain level, else the consumer will prefer an alternative product.

Within this context, patents must be considered as a last resort to create an artificial, legal exclusivity if there is no other opportunity for differentiation. That is the case if the only opportunity for differentiation is based on exclusive skills, *and* if the pertinent knowledge can be applied by any “Person Having Ordinary Skill In

²⁹ *Diamond v. Chakrabarty*, 447 U.S. 303, 303, 100 S.Ct. 2204, 2205 (1980).

³⁰ 35 USC § 103(a).

³¹ JOSEPH A. SCHUMPETER, *CAPITALISM, SOCIALISM AND DEMOCRACY*, p. 81-86 (1942).

³² PAUL A. SAMUELSON & WILLIAM D. NORDHAUS, *ECONOMICS*, 148 (2005).

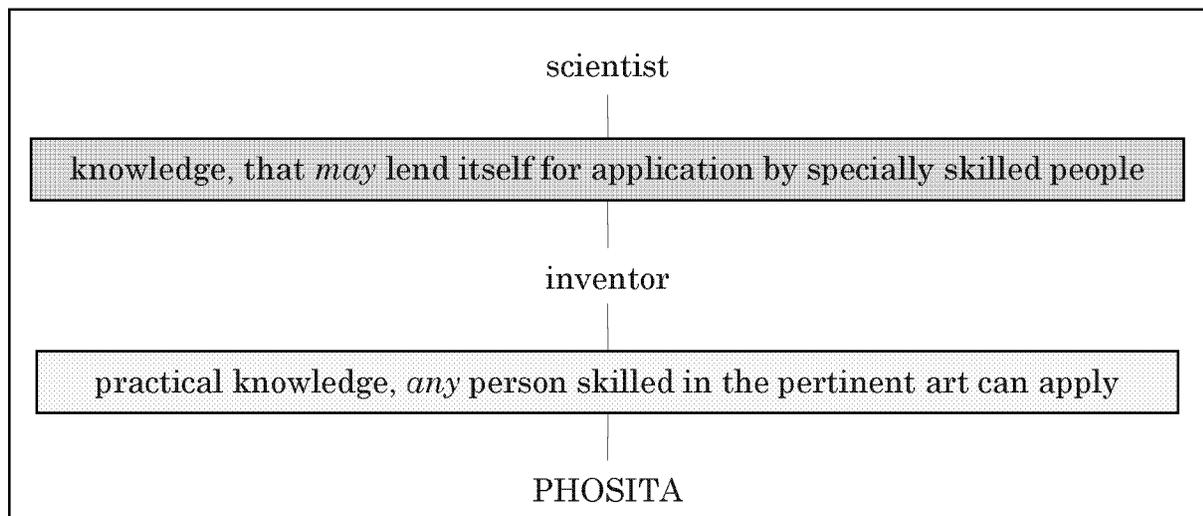
³³ SAMUELSON & NORDHAUS, *supra* note Error: Reference source not found, at 150.

³⁴ F.M. SCHERER & DAVID ROSS, *INDUSTRIAL MARKET STRUCTURE AND ECONOMIC PERFORMANCE* 571 (1990).

³⁵ SAMUELSON & NORDHAUS, *supra* note Error: Reference source not found, at 168.

The Art”, a “PHOSITA”.³⁶ More simply said: knowledge that can be applied by any POSITA does not allow differentiation, while knowledge requiring special skills – and luck – has a natural exclusivity.

The relationship between the two types of knowledge is elaborated in the following diagram:



At the top, the type of knowledge is shown typically produced by scientists. This “upstream” knowledge can only be applied by inventors. They may turn that knowledge into practical knowledge, that allows application by a PHOSITA. The distinction between the inventor and the PHOSITA is not just a matter of skill level: a genuine PHOSITA *by definition* is able to accomplish the job, while an inventor in contrast is fundamentally uncertain to reach a result. If a constructor is unable to build a house, he is not a PHOSITA, but if an inventor fails to develop a new cure for a specific disease, he usually can’t be blamed. Even if the roles of scientist, inventor and/or PHOSITA are occasionally combined in a single person, still the distinction can be made between the two types of knowledge.

Only the latter type of knowledge – practical knowledge any PHOSITA can apply – may need patent protection, as we noted above. And the statutory enabling specification requirement³⁷ only allows the latter type of knowledge to be patented. While we apparently only confirmed the statute, we found a *reason* not to grant patents for the “abstract” type of knowledge shown at the top of the diagram. This reason substantiates the vague “abstract idea” concept. It helps to interpret the distinction if it can be *understood*, if a definitive verbal definition is perhaps not feasible.

The above knowledge type dichotomy shows precisely how business methods should be positioned in patent law: a true businessman resembles more an inventor than a PHOSITA, because he depends on special skills (business creativity), and he can’t be sure to be successful. So his “raw material”, the business method, resembles

³⁶ 35 USC § 103.

³⁷ 35 USC § 112.

unpatentable science more than the concrete knowledge shown at the bottom of the diagram, that could be patentable subject-matter. Writers too have made the observation that business method patents are not needed to prevent “free riding”.³⁸

Incidentally, the uncertainty of the businessman should not be confused with the uncertainty associated with *any* invention whether it will be commercially viable. The relevant criterion is whether the application of the pertinent knowledge is likely to be successful. Selling a product is a subsequent phase. And its success depends on external factors (like market demand and competitive activity), so that it can't be a *property*³⁹ of the pertinent knowledge.

If business method patentability is decided as proposed, there is no need for a prior assessment whether a patent application relates to a business method – a question that has been found hard to answer.⁴⁰ The above knowledge dichotomy is decisive. Most business methods are not the kind of practical knowledge than *can* be described in such a way that any PHOSITA is able to carry out the method “without undue experimentation”,⁴¹ i.e. with the typical trial and error that is typical for a business operation. But if an occasional business method is sufficiently practical in this sense, it still may constitute patentable subject-matter. In the end, the abstractness (in the above sense) is decisive, not a qualification as “business method”. This is compliant with the fact that the majority in *Bilski v. Kappos* rejects a categorical exclusion of business method patents.⁴²

Practice shows, that patents indeed often are used to control competition, e.g. in the context “strategic” patenting.⁴³ It is essential to acknowledge that patents are no “reward”:⁴⁴ patents are not a kind of “copyright for technology”.

Investments are protected if a business is viable, i.e. if it is competitive. Protection by patents is an exception. As *Justice Stevens* explains in his opinion,⁴⁵ business methods are not something new: they existed for thousands of years, and never were protected by patents. The rule – at least in the western world – is freedom of

³⁸ Rochelle Cooper Dreyfuss, *Are Business Method Patents bad for Business?* 16 SANTA CLARA COMPUTER & HIGH TECH. L.J. 263, 275 (arguing that for business methods there is neither a “free rider” nor a disclosure problem).

³⁹ Here we refer to “property” in a philosophical rather than a legal sense. This “property” concept refers to *inherent* attributes of objects, attributes that do not depend on circumstances.

⁴⁰ *State Street v. Signature*, 149 F.3d 1368, 1377 (1998).

⁴¹ *Supra* note Error: Reference source not found.

⁴² *Bilski v. Kappos*, 130 S.Ct.at 3222.

⁴³ STEPHEN A. MERRILL, RICHARD C. LEVIN & MARK B. MYERS (EDS.), *A PATENT SYSTEM FOR THE 21ST CENTURY*, 37 (2004). <http://books.nap.edu/html/patentsystem/0309089107.pdf>; Knut Blind, Katrin Cremers & Elisabeth Mueller, *The influence of strategic patenting on companies' patent portfolios*, 38 RESEARCH POLICY 428, 429 (“There is no agreed definition of strategic patenting, although most experts include the use of patents to block competitors and the use of patents in negotiations with other companies.”)

⁴⁴ Fritz Machlup & Edith E.T. Penrose, *The Patent Controversy in the Nineteenth Century*, 10 JOURNAL OF ECONOMIC HISTORY 1950, 1, 21.

⁴⁵ *Bilski v. Kappos*, 130 S.Ct. 3218, 3231-57 (2010).

competition. Historically, the patent system actually replaced a system of government-granted monopolies.⁴⁶

Pitfalls

The quest for rules to substantiate the “abstract ideas” exception has led to some persistent misconceptions.

There is a concern that a patent should not monopolize an “abstract idea”, preempting all its applications.⁴⁷ That is paradoxical, because all inventions are abstract somehow (inventions basically are *thoughts*), and patents are often equated to monopolies. While this is not entirely correct (“monopoly” is an economic rather than a legal concept, and patented products may have substitutes, perfect or non-perfect), the purpose of patents is indeed to create market power, else they would not be effective. The correct criterion is whether the full scope of the patent claims is matched by an commensurate disclosure. The patent owner should not have the right to prevent others from doing things he is not (yet) able to himself – the objection against Morse’s famous eighth claim.⁴⁸ Conversely, if the claims are fully covered by the disclosure, there is no objection against a “monopoly” from the perspective of patent law.⁴⁹ Competition law addresses *abuse* of monopolies.

In particular in the 1970s and the 1980s, there were concerns about monopolizing “mathematical” algorithms, notably in conjunction with computer programs. In practice though, concepts like “mathematics” and “algorithms” have been found to be problematic in a legal context. For instance, the Federal Circuit found itself forced to make a distinction between mathematical and non-mathematical algorithms, in order to reconcile Supreme Court precedent, prohibiting the patenting of “mathematical” algorithms, with the observation that any “process” is a kind of “algorithm” in the sense of a precise description of steps leading to a specific result – and the statute allows processes to be patented.⁵⁰ Should a potentially life saving application be considered unpatentable if its essence is a “mathematical algorithm”?⁵¹ The court decided that basically the abstractness itself is decisive, to be assessed regardless of the presence or absence of mathematical elements.⁵² Saving lives is not “abstract”, even if it is based on mathematics.

Another misconception is the idea that a patentable invention should lead to a physical result. Still, the “useful, concrete and tangible result” criterion⁵³ was not interpreted in the sense that “tangible” means “physical”. Actually, the purport is

⁴⁶ Statute of Monopolies, 1624.

⁴⁷ *Gottschalk v. Benson*, 409 U.S. 63, 72, 93 S.Ct. 253, 257 (1972).

⁴⁸ *O’Reilly, et al. v. Morse*, 56 U.S. 62, 86 (1854). In his eighth claim (the last), Morse claims “... the use of the motive power of the electric or galvanic current, which I call electro-magnetism, however developed, for making or printing intelligible characters, letters, or signs, at any distances ...”.

⁴⁹ Abuse of market power may violate competition law though.

⁵⁰ *In re Iwahashi*, 888 F.2d 1370, 1374 (1989).

⁵¹ *Arrhythmia v. Corazonix*, 958 F.2d 1053, 1065-66 (1992) (“Furthermore, the claims do not disclose mere abstract ideas, but a practical and potentially life-saving process.”)

⁵² *In re Alappat*, 33 F.3d 1526, 1544 (1994).

⁵³ *Id.*

the opposite.⁵⁴ The only thing that really matters is whether patents are economically meaningful. Transforming flour⁵⁵ or information potentially adds value too. Value is decisive in view of the economic function of patents, and value does not depend on physicality.

The “machine” prong of the “machine or transformation test” specifically states that “insignificant post-solution activity” can not save the patentability of otherwise unpatentable subject-matter. This observation relates to the persistent concern, that smart claims drafting can “save” the patentability of actually unpatentable subject-matter, by arbitrarily adding patentable features, like a machine.⁵⁶ While obviously patentability should not depend on the drafting skills of the patent agent, this is still a paradoxical rule, because the statute explicitly requires the application to be assessed *as a whole*,⁵⁷ prohibiting a dissection into “significant” and “insignificant” features. And that rule makes sense too, in particular for inventions that are *systems* of components conceivably none of which is actually novel.⁵⁸ Still both rules can’t be valid at the same time. This paradox was particularly apparent in EPO and German case law from the 1970s. The solution to this paradox is to acknowledge that inventions fundamentally are *thoughts* rather than *things* (even if claims may give a different impression). It is the thought that must provide a comprehensive solution that can be carried out by the PHOSITA, as outlined above.

The “transformation” prong of the “machine or transformation test” implicitly presumes that at least some business methods do not make a “transformation”. But why? The origin of this requirement is an age-old case where the observation was made that a particular invention was still patentable although it did not claim any new machine, because it made a “transformation” in the bolting process of flour.⁵⁹ Isn’t a “transformation” in this context any type of activity that lends itself for “useful”⁶⁰ commercial exploitation, because it adds value? Most business methods will make that type of “transformation”.

Conclusion

The generally recognized “abstract ideas” exception should be substantiated by the criterion whether any Person Having Ordinary Skill In The Art is able to carry out the invention. A truly “abstract idea” *can not* be described in such a way that any

⁵⁴ AT&T, 172 F.3d at 1358-59, 50 USPQ2d at 1452 (Transformation “is not an invariable requirement, but merely one example of how a mathematical algorithm [or law of nature] may bring about a useful application.”).

⁵⁵ See *Cochrane v. Deener*, 94 U.S. 780 (1877).

⁵⁶ President’s Commission on the patent system, *“To promote the progress of ... useful arts”, in an age of exploding technology*, 14 (1966): “Indirect attempts to obtain patents and avoid the rejection [of patents on programs], by drafting claims as a process, or a machine or components thereof programmed in a given manner, rather than the program itself, have confused the issue further and should not be permitted.

⁵⁷ 35 USC § 103.

⁵⁸ *Diamond v. Diehr*, 450 U.S. 175, 188-89, 101 S.Ct. 1048, 1057-58 (1981).

⁵⁹ *Cochrane v. Deener*, 94 U.S. 780, 788 (U.S. Dist. Col. 1876)

⁶⁰ 35 USC § 101.

PHOSITA can be sure to be able to accomplish the task successfully. In statutory terms, the requirement of an enabling specification⁶¹ shows that certain subject-matter does not fit into the system of patent law. Thus Section 112 gives a clue how to interpret Section 101 – but it does not replace Section 101.

This conclusion follows from a consistent line of 19th and early 20th century precedents. At the same time, it reflects the true economic purpose of patents – which is often misunderstood: patents are not a “reward” for any valuable brainwork, let alone a means for a pervasive “commodification” of knowledge.

The above criterion is particularly helpful to assess business method patent applications. A business method is often an “abstract idea” in this sense, because a businessman is more an inventor than a “PHOSITA”. A PHOSITA basically is a craftsman, and conducting a business is not a craft, it is an art. Still, conceivably some business methods may be carried out routinely by a PHOSITA. And then there is indeed no reason not to grant a patent. In our perspective, the abstractness is decisive, to be assessed in the above way, rather than the qualification as a “business method”

This approach avoids the perceived problems to classify subject-matter as “business methods”, and it does not ban business method patenting categorically, in compliance with *Bilski v. Kappos*, and in compliance with § 273, if that provision must indeed be understood as a recognition by Congress of the patentability of (some) business methods.

In its invitation for comments, the USPTO specifically asks whether any proposed new guidelines will lead to results deviating from the results of the “machine or transformation” test. The question is hard to answer, for more than one reason. Firstly, this test was only considered an exclusive test for twenty months,⁶² so there is only a limited amount of case law showing its actual purport. One of the reasons this test was rejected (as the exclusive test) was that it is ambiguous. A more fundamental reason why the proposed approach is hard to compare with the “machine or transformation” test is that it starts from a very different perspective. A fully elaborated application may be patentable in the proposed approach, even if it may not be perceived as making a “transformation”, while a sketchy abstract idea, that should not be patentable in our perception, may still relate to a “transformation”.

For interpretations, it is essential to keep in mind that investment is not an argument for patents. Patents control competition, if and when needed. In the western free market society, competition is the rule, and protection the exception. A healthy business is protected more by competitive strength than by law.

⁶¹ 35 USC § 112.

⁶² Between 20 October 2008 and 28 June 2010.