The Patentability of Software under the EPC

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IP Brochure

The invention of the microprocessor and the resulting digital revolution has created an ever-increasing variety of software-controlled products and services, which have led to what is referred to as the age of information technology and Industry 4.0. The protection of costly investments in innovative technology in the fields of telecommunication, software development, “big data” analysis, quantum computing and artificial intelligence has strategic importance for the competitiveness of any market participant, be it a global player or a small start-up company. Although the justification of patent protection for software-related inventions may still be prone to controversy among policymakers, lobbyists and the media in Europe, case law of the Boards of Appeal of the European Patent Office has clarified various fundamental issues in this respect so that patentability of software-related inventions under the EPC has become relatively predictable.

The following executive summary explains the legal status quo under the European Patent Convention (EPC) and elucidates the possibilities available for and the limits imposed on the obtaining of European patents for software-related inventions.

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1. What is an “invention” under the EPC?

The legal situation is even more complex, since the listed examples are only excluded from patentability to the extent that they are claimed “as such”. Consequently, the EPC does not consider these items to be non-inventions under all circumstances, but postulates the development of suitable criteria by case law that will distinguish patentable subject-matter from subject-matter excluded “as such” for all the items on the list. With respect to computer programs, the criteria developed by the case law are explained below.

The EPC does not define the term “invention”. However, the EPC specifies the qualities an invention must have if it is to be patentable, i.e. it must be novel, involve an inventive step and be susceptible of industrial application. Under the EPC, the term “invention” should therefore be understood as “subject-matter generally eligible for patent protection” without a priori having the required qualities of being novel, inventive and industrially applicable. The EPC contains an exemplary list of items that are not regarded as inventions and are excluded from patent protection regardless of whether they have the above qualities. Among the excluded items on the list are

- mathematical methods,
- schemes, rules and methods for performing mental acts, playing games or doing business, programs for computers, and
- presentations of information.

2. Software / Computer programs / Computer-implemented inventions?

Computer programs are on the list of items excluded “as such” from patentability. In order to underline the fact that computer programs may only be inventions if they meet the criteria explained below, it seems appropriate to coin a new term for patentable subject-matter involving the use of computer hardware and/or software, *i.e.* “computer-implemented inventions” (CIIs). This term is regularly used by the European Patent Office (EPO) when assessing the patentability of software under the

EPC.

3. Technical character

The basic criterion for deciding whether the subject-matter defined in the claims of a European patent application may be regarded as an invention is the presence of a "technical character". This requirement is grounded in a traditional European understanding and has been firmly established by the judicial practice of the Boards of Appeal of the EPO for CIIs and indeed for all fields of technology. As mentioned above, the currently applicable version of the EPC refers to this requirement. In a first step of the examination whether a European patent can be granted, the claimed subject-matter is therefore to be assessed to determine whether it has a technical character, *i.e.* is an invention. This is followed by a second assessment (see sections 5 et seqq. below) to determine whether the invention meets the other requirements for patentability, *i.e.* novelty, inventive step and industrial applicability.

The term "technical" (here synonymous with technological), though mentioned at various places in the EPC, is defined neither by the Convention nor by case law. Moreover, the general understanding of this term is not static, but may change over time. However, the situation is not hopeless in that, on the basis of its historic roots, the core area of the meaning of "technical" is clear and gives reliable directions for future extrapolations. In particular, the items on the "as such" exclusion list should be regarded as non-technical.

The extrapolation approach may be illustrated by the example of a washing machine. In the past, the various steps in the operation of a washing machine (pumping, soaking, tumbling, etc.) were performed under the control of some kind of mechanical control unit. There can be no doubt that such a mechanism and the controlled steps in the washing process had a technical character and were thus eligible for patent protection. Modern washing machines no longer use a mechanical control unit but instead a combination of hardware and software. There is no reason why the transition to computer-controlled operation of the washing machine should affect its general eligibility for patent protection. Moreover, an innovation in the operation of such a washing machine should be patentable regardless of whether it is implemented in a mechanical controller, dedicated hardware or only in software

running on an off-the-shelf-micro-processor. A narrow definition of the term “technical” that would exclude such innovations is not appropriate.

It is self-evident that when any computer program is loaded to and running on a computer it causes physical transformations of bit patterns by modifying electrical charges with the aid of electrical voltages and currents. If these phenomena themselves were considered to be sufficient for the required technical character, a dilemma would arise: either all computer programs would be eligible for patent protection, in contradiction to the law, or – in the absence of a discriminating criterion – no programs would be patentable.

This dilemma has been solved by judicial practice holding that the above-mentioned self-evident technical effect achieved by all computer programs is not sufficient for the grant of patent protection. A further technical effect beyond that self-evident effect is required to distinguish patentable programs from programs “as such”, the further technical effect residing in the nature and purpose of the computer program. In particular, programs serving a technical application by e.g. controlling technical processes or apparatuses may be seen to achieve such a further technical effect and are hence eligible for patent protection. Illegal use of such controlling software may therefore be regarded, and prosecuted, as a direct patent infringement.

In the above example, the controller for a washing machine may be implemented by a conventional hardware processor and an innovative controlling program running on this processor. The program causes a further technical effect beyond its standard interaction with the hardware processor by controlling a technical apparatus and may therefore be separately claimed and protected.

Since a computer itself is also a technical apparatus like the washing machine discussed above, the same approach may be applied in that all programs which control the internal functioning of a computer (*i.e.* which make or keep the computer running) so that it can be used as a platform for any applications should be patentable, such as the BIOS or the operating system.

In summary, a computer program is not necessarily a technical means, and the art of programming is not necessarily a technical activity. Only those programs that lend themselves to a technical application are considered to have a technical character,

i.e. to have become a technical means.

4. Assessment of technical character under the EPC

Purely abstract or aesthetic concepts devoid of any technical implications are not considered to be inventions. They generally fall under the “as such” exclusions explicitly mentioned in the EPC (see above). In all other cases, judicial practice has greatly simplified the assessment of technical character by establishing that concrete man-made products/devices/apparatus have per se a technical character. Methods/processes have a technical character if they employ technical means, irrespective of whether or not these means are conventional, provided that they are explicitly set out in the claims of a European patent application.

Hence, the first hurdle to patentability requiring the presence of an invention is rather low, and any claimed subject-matter with an explicit technical bearing is taken “on board”. This particularly applies to mixtures of technical and non-technical features in a claim, which is common practice. For the assessment of technical character, no prior art is taken into account because the technical character is an absolute requirement regardless of whether the subject-matter claimed is known or obvious from the prior art. Technical character is therefore already present if a method claim sets out hardware components or peripherals, in particular a conventional PC, or if a device claim relates to a conventional data carrier storing a program.

5. The assessment of the further patentability requirements for CIIs

At this stage of the examination procedure, available prior art arrives on the scene and serves as a basis for evaluating the above-mentioned qualities of an invention. This assessment, in particular with respect to inventive step, is the second hurdle to patentability for a computer-implemented invention, and is by far more difficult to overcome than the first hurdle.

5.1 Industrial applicability

Computer-implemented inventions are normally susceptible of industrial application, so that this requirement is easily fulfilled.

5.2 Novelty

Novelty is generally present if not all features of a claim are known from a single item of prior art. Whether non-technical features of a claim alone may establish novelty over the prior art does not appear to have been conclusively decided by case law. This issue is, however, of minor practical importance since it can normally be bypassed by directly considering inventive step.

5.3 Inventive step

When examining inventive step, a major problem arises for a claim containing a combination of technical and non-technical features: Can an inventive step be acknowledged on the basis of a non-technical feature only? However, since in this context not only differences have to be considered, but also their effects, which must be of technical nature, judicial practice has given a clear answer to this question by laying down that an inventive step can only be based on one or more features that contribute to the required technical character. More specifically, a feature justifying the acknowledgment of an inventive step must serve the technical solution of a technical problem.

This approach has important consequences for the practical assessment of inventive step: Based on the above approach, the relevant skilled person is a person skilled in the technical (or technological) arts. They are neither competent in, nor do they take account of non-technical knowledge. Any non-technical input is considered to be transferred by a non-technical expert to the technically skilled person as a framework within which the skilled person may become active. In other words, features which do not contribute to the technical character of the claimed subject-matter are to be excluded from the assessment of inventive step and treated as pre-existing constraints for the technical problem to be solved. The prior art is then used for assessing whether the novel technical features were obvious in view of the technical problem and the pre-existing constraints.

In this context, it is regularly held that the mere automation of non-technical concepts (

e.g. in business or financial services) by means of conventional hardware and normal programming skills lacks an inventive step.

All in all, inventive step proves to be the barrier that sorts the wheat from the chaff in the field of computer-implemented inventions.

5.4 Clear and complete disclosure

Apart from novelty and inventive step, an invention has to be disclosed in the description and the drawings of a patent application in a manner sufficiently clear and complete for the average person skilled in the art of the related technical field to be able to carry out or rework the invention.

Computer-implemented inventions usually consist of a variety of interacting components, such as a large data pool, complex algorithms, interaction of different system components, etc.

To fulfill the requirement of clear and complete disclosure, all components relevant for the invention should be sufficiently acknowledged and described in a patent application.

It is advisable in this respect, on the one hand, to explain the functionalities conceptually, *i.e.* regardless of the specific implementation, and, on the other hand, to also describe specific implementation options and alternatives.

Special attention should be paid to disclosing the individual functional components as "modularly" as possible, so that afterwards, individual parts of the invention may be used for delimiting it from the prior art without having to limit oneself to further parts that are unnecessary for this purpose.

6. Summary of current EPO practice

Following the structured approach developed by the Boards of Appeal, the EPO's current practice in examining software-related inventions may be summarizsed by the following sequence of questions:

(i) Does the claimed subject-matter define or use technical means?

If it doesn't the claimed subject-matter is not eligible for patent protection and hence not allowable for this reason.

If it does, it has the required technical character and is an invention. The first hurdle has been overcome.

(ii) Is the claimed subject-matter distinguished from the available prior art?

If it isn't, the claimed subject-matter lacks novelty and is hence not allowable for this reason.

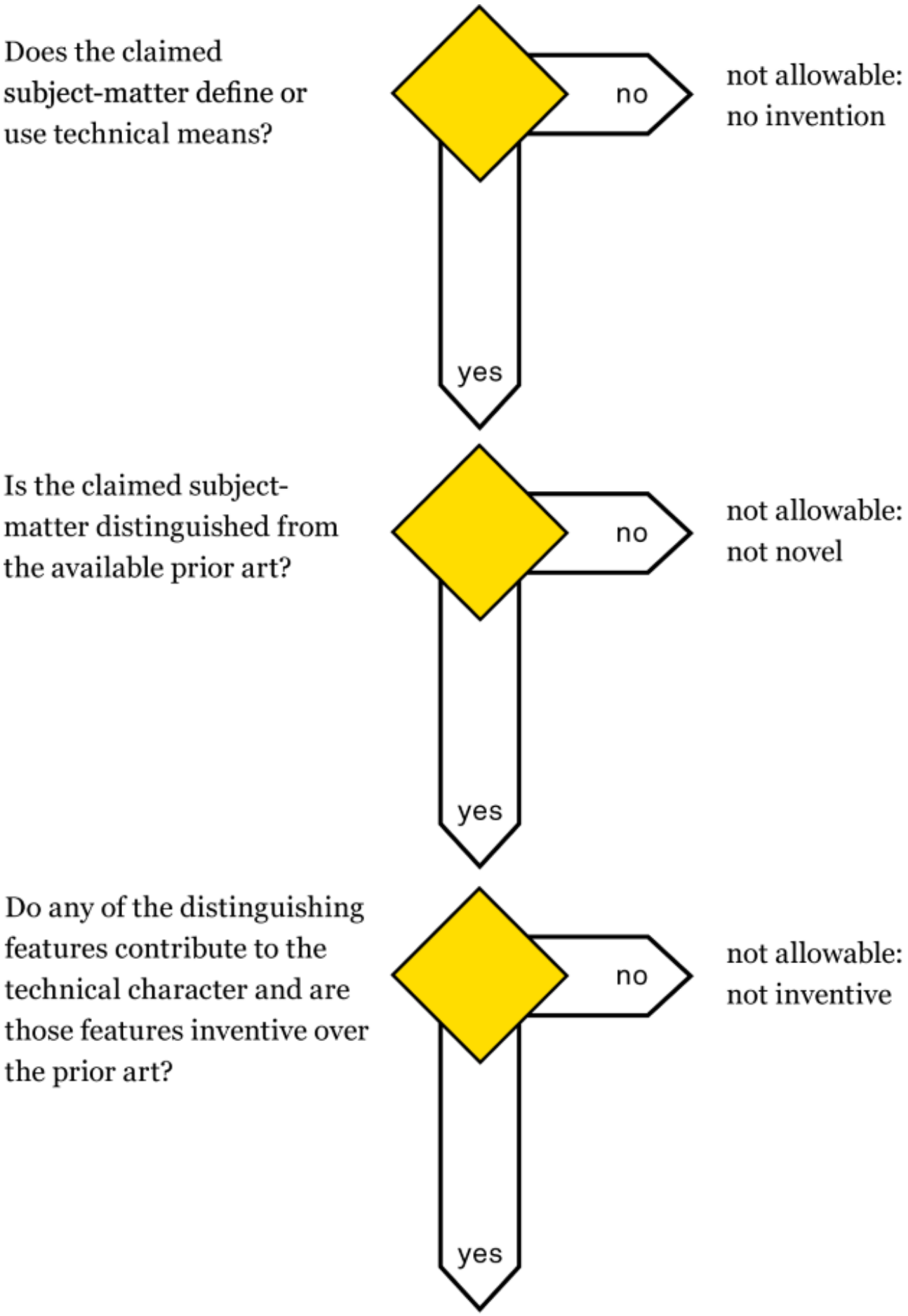
If it is, it is novel.

(iii) Do any of the distinguishing features contribute to the technical character and are those features inventive over the prior art?

If it doesn't, the claimed subject-matter does not involve an inventive step and is hence not allowable for this reason.

If it does, a patent may be granted. The second hurdle has been overcome.

The following figure illustrates the above sequence of steps:


Does the claimed subject-matter define or use technical means?
no
not allowable: no invention
yes
Is the claimed subject-matter distinguished from the available prior art?
no
not allowable: not novel
yes
Do any of the distinguishing features contribute to the technical character and are those features inventive over the prior art?
no
not allowable: not inventive
yes
patent granted

7. Claim format for computer-implemented inventions

Software-related inventions are predominantly claimed as computer-based methods or processes where the basic concept of an underlying program is expressed by method steps. This formulation normally highlights the main thrust of such a program: It will be apparent from the method what the program is aiming at and what effects are achieved. Computer programs may also be claimed by themselves or as records on a carrier. The category of computer programs (or computer program products) has to be distinguished from method claims since programs are only an inanimate sequence of computer readable instructions that have the potential for achieving concrete effects when loaded to and running on a computer, whereas method steps are actually carried out and effects are actually achieved. If claimed as a computer program, computer program product or a record on a carrier, such a claim is in most cases added and refers back to a corresponding method claim. A literary presentation of all program instructions, such as for copyright purposes, is neither required nor useful.

Device/apparatus claims, or, in case of “distributed” inventions like client-server architectures, system claims or claims to subunits of such systems are also possible, and frequently refer to program constructs as modules or means. Finally, the claiming of data and signal structures or formats is conceivable, even though it approaches the grey a of purely mental acts.

8. Specific aspects decided by case law

8.1 Information modelling

Information modelling, though a precursor for program design, has been considered to be a non-technical activity as such. It might contribute to the technical character only if specifically applied in a technical environment.

8.2 Database technology

Database technology, in terms of the technical functions and data structures actually stored in the computer, has been found to be technical. Likewise, the exchange of data between different application programs using functional data structures (e.g.

clipboard formats) were considered an extension of the inner operation of a computer system and were thus found to be patentable. In addition, programs that refer to garbage collection and aspects of data retrieval were also considered to provide a technical effect.

8.3 Mathematical methods/simulation

On the one hand, mathematical methods as such are also on the list of non-inventions. On the other hand, mathematics easily qualifies for technical applications. In this respect, it was found that a linear combination for automatically selecting a database management system in a data consistency management system has technical character, since it significantly contributes to the operation of the system.

Even a simulation that is essentially based on mathematical models can solve a technical problem if it produces a technical effect that exceeds the mere implementation of the simulation.

It is not sufficient for the simulated system to be technical. The decisive factor is whether the simulation achieves a technical advantage. This is the case, among other things, if the claimed subject-matter establishes a concrete connection to physical reality. This would be the case, for example, if the results of a weather simulation were used to control a cat flap so that it can only be opened in good weather.

However, even a simulation without a direct connection to physical reality can solve a technical problem, for example by adapting the simulation software to the internal functioning of the computer system or network. This can result in technical advantages, such as a more efficient use of memory.

8.4 Business methods/Financial transaction

Such concepts – that are excluded as such – are hardly suitable for technical applications and, thus, must not be considered when inventive step is assessed.

What could, however, turn out to be patentable are special implementation aspects using hardware designs or program constructs that, in themselves, have a technical character. It is therefore important to include as many concrete technical implementation details as possible to support sufficiency of disclosure and to increase the chances of obtaining a patent for innovations in this field.

8.5 Information/Translation

Pure information contents are not patentable. However, the use of a piece of information in a technical system, or its usability for this purpose, may confer a technical character on the information itself in that it reflects the properties of the technical system in which it exists, e.g. by being specifically formatted and/or processed. Linguistic aspects of a translation process may also generally assume a technical character if they are used in a computer system and form part of a solution to a technical problem.

8.6 Graphical user interfaces (GUIs)

Judicial practice is reluctant to attribute technical character to the design of graphical user interfaces, particularly if they are only based on aesthetic considerations or solely aim to facilitate human perception or mental processing. Visual indications of the internal states of a technical system in the form of visual feedback for human interaction with the system have, however, been accepted as technical. All in all, for the time being it appears that, even though they use one and the same structured approach to assessing patentability, different Boards of Appeal are not consistent in drawing the line in respect of technical character of GUIs. Rather, the assessment seems to depend on whether a broader or narrower construction of the meaning of “presentation of information” (which are excluded “as such”) is applied.

8.7 Computer games

Computer games naturally involve schemes, rules and methods for playing games, software and presentations of information through graphical user interfaces. All of these aspects have to be carefully examined to see whether they make a technical contribution. Aspects purely driven by game rules have to be ignored.

8.8 Bioinformatics

Albeit not abundant at present, the existing case law throws light on the realms of technicality in bioinformatics and follows the established view in other technical fields that features excluded “as such” must not be ignored or separated if they serve a technical purpose and thus contribute to the technical character of the claimed

subject-matter. In particular, an automated genotype determination is technical, and improving the confidence of the genotype estimate relates to a technical problem.

Any means contributing to the solution of that problem therefore qualifies as technical means.

8.9 “Big data” and artificial intelligence

Not least due to the rapid development of the Internet and the success of smartphones, the global data pool has grown almost exponentially in the last few years. The development of modern high-performance processors and the steadily growing storage media make the efficient analysis of “big data” possible. Knowledge obtained from this in conjunction with artificial intelligence (AI) has created voice and face recognition systems, autonomously driving cars as well as adaptive production facilities. By now, the latter play a central role in the area of Industry 4.0, with the use of AI not only improving known manufacturing processes but also the automation of drafting and design processes. But also in other high-tech sectors, such as medical technology and the pharmaceutical industry, AI systems are now increasingly used. The core of AI systems is usually constituted of software that controls and monitors the training of self-learning AI systems.

As regards protection of AI-related inventions, a variety of aspects arise which have to be taken into consideration in the process of drafting and granting patents. What is paramount here is the protection of AI systems as such, of “big data” used for training the neural networks used in AI systems and of products manufactured by such systems.

For software-implemented components of AI systems, the above-described rules and approaches from the field of computer-implemented inventions are used for determining patentability. The focus is thus also on assessing whether individual features of the invention solve a technical problem by technical means.

Since the software-implemented functioning of an AI system is often not or hardly predictable, especially the correct explanation of the functioning of an AI system is a great challenge in drafting a corresponding patent application as the latter has to disclose the invention in a manner sufficiently clear and complete for the person skilled in the art to be able to carry it out (or to rework it). Therefore, all components of an AI-related invention should comprehensively be acknowledged in an associated

patent application, from the training data, the used training method, and the configuration of the neural network underlying the AI system to the manufactured product or result. Ideally, the patent application also contains measurement data that make the functioning of the AI system underlying the invention plausible.

The protection of products generated by an AI system is less problematic, because here the conventional standard of examination for assessing inventive step applies.

8.10 Quantum computing

Quantum computing is a completely new type of computing that exploits the laws of quantum physics. While classical computers process information as zeros and ones, quantum computers work with so-called qubits, which can be not only 0 or 1, but can also assume a kind of mixed state in between. This allows a quantum computer to follow many calculation paths simultaneously, instead of going through them one after the other. In addition, qubits can be connected to each other, so that a change in one qubit immediately affects others. In this way, extremely complex relationships can be represented. In theory, quantum computers can thus solve problems that are practically unsolvable for normal computers, such as simulating molecules for new drugs, optimizing traffic flows, or cracking certain encryptions.

With regard to patentability, the same requirements apply to quantum computer algorithms as to programs for conventional computers: they are eligible for patent protection if they solve a technical problem using technical means.

The real challenge with regard to quantum computer-related inventions is therefore likely to lie in the complexity of the algorithms, which is significantly higher than that of conventional software. When drafting invention disclosure reports and patent applications, particular attention should therefore be paid to the technical correctness of the invention description in order to prevent possible objections regarding lack of clarity or lack of feasibility.

9. Referrals G 3/08 and G 1/19

At the end of 2008, the above case law was challenged by the President of the EPO, who referred questions to the Enlarged Board of Appeal and alleged divergences between various decisions on the patentability of computer programs, in particular on

how narrowly the exclusions from patentability were to be construed. In its Opinion of May 12, 2010, the Enlarged Board decided that the Referral G 3/08 was inadmissible since no divergences in the sense of “conflicting decisions” could be identified.

In the Opinion of March 10, 2021 concerning Referral G 1/19, the Enlarged Board of Appeal confirmed the application of the practice for assessing inventive step of computer-implemented inventions explained at the beginning of this IP Brochure, which particularly equally is to be applied to examining the patentability of computer-implemented simulations.

Hence, the case law on CIIs must be considered to be firmly established as it stands, thus promoting legal security.

10. Summary

Inventions involving computer hardware and software are patentable under the EPC

- if they have technical character by relating to a technical product or to a method employing technical means, and
- if the combination of the features that contribute to the technical character is novel and involves an inventive step over the prior art.

If these requirements are met, claims in the format of method, system, apparatus and computer program (with and without carrier) are allowable. It is furthermore important to include concrete technical implementation details in the patent application to support sufficiency of disclosure and to increase chances of grant.

11. Further information

Further information on the “patentability of software” can be found in:

- Stobbs, Gregory A.: “*Software Patents Worldwide*”, WOLTERS KLUWER LAW & BUSINESS, ISBN-13: 978-9041125026
- Steinbrener, Stefan V.: “*Patentable subject matter under Article 52(2) and (3) EPC: a whitelist of positive cases from the EPO Boards of Appeal Part 1*

", in Journal of Intellectual Property Law & Practice, Volume 13, Issue 1, 1 January 2018, Pages 13–35.

- Schuster / Grützmacher: "*IT-Recht Kommentar*", Verlag Dr. Otto Schmidt, new revised 2nd edition. ISBN: 978-3-504-56109-3
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