



The Enlarged Board of the EPO Establishes a Definitive Approach to Patentability of Simulations

The Enlarged Board of Appeal of the EPO has, in case [G 01/19](#) (Pedestrian simulation), issued a decision regarding the patentability of simulations under the EPC. This decision was eagerly awaited as the referral to the Enlarged Board raised fundamental questions about the patentability of simulations at the EPO.

Given that simulations of technical systems had generally been considered patentable with some caveats to be applied on a case by case basis, this decision had the potential to have wide reaching consequences regarding a significant and growing area of innovation in Europe.

Computer-implemented inventions such as simulations are dealt with at the EPO using the well-established Comvik approach for determining patentability. However, questions have been raised by some technical boards of appeal regarding the application of the Comvik approach to inventions based on simulations, particularly those which as claimed did not have a physical effect or interact with the real world in some way. In general, older case law was generally cited as precedent that the design or simulation of a technical system was itself technical and eligible for patent protection. However, more recent cases have perhaps limited the extent to which simulations were considered patentable.

In the present referral, the technical board of appeal in case [T 0489/14](#) intended to find a simulation of a technical system as non-technical and therefore not patentable. In view of the potential divergence in case law, the technical board referred questions on the patentability of simulations to the Enlarged Board.

In [G 01/19](#), the Enlarged Board confirms that a computer-implemented simulation of a technical system or process as such can solve a technical problem and therefore produce a technical effect. However, it is not sufficient that a technical system is simulated; the simulation must have a technical purpose, at least implicitly. The Enlarged Board confirms that the Comvik approach is suitable to be applied to simulations in much the same way as applied to any other computer-implemented invention, and patentability of simulations should be determined on a case by case basis.

The decision, therefore, does not reflect a fundamental change in practice for the EPO, but reasserts that many simulations are patentable under the EPC, to the benefit of applicants, and clarifies the conditions to be met for patentability.

Legal Background

Article 52(1) EPC states that “a European patent shall be granted for any invention, in all fields of technology, provided they are

new, involve an inventive step and are susceptible of industrial application”. Article 52(2) EPC contains a non-exhausted list of “non-inventions” which provides further clarification of the meaning of the phrase “an invention” in Article 52(1) EPC. The list in Article 52(2) EPC includes “schemes, rules and methods for performing mental acts, playing games, or doing business, and programs for computers”. Article 52(3) EPC provides that the exclusions of Article 52(2) EPC only apply when “a European patent application or European patent is directed to such subject-matter or activities as such”. This limitation prevents a broad interpretation of the “non-inventions” listed in Article 52(2) EPC.

The approach of the EPO to computer-implemented inventions in light of Article 52 EPC has developed over the years, eventually being settled by Comvik (T 154/04). Following the Comvik approach, a claim directed to a computer-implemented invention avoids exclusion under Article 52 EPC merely by referring to the use of a computer, a computer readable storage medium or any other technical means, reflecting the narrow interpretation of the provisions of Article 52 EPC. The use of a computer in this case represents the technical means required to provide a technical effect to the claimed invention.

However, overcoming the exclusions for patentability in Article 52 EPC represents only the first of two “hurdles” in the Comvik approach. The second “hurdle” of Comvik is found in the application of Article 56 EPC when considering the inventive step of a computer-implemented invention.

When dealing with any invention, the EPO applies the problem+solution approach to inventive step. In the problem+solution approach, the distinguishing features of the claimed invention are established, the technical effect of these features is determined and the problem solved by the invention as claimed is derived from this technical effect. In the context of a computer-implemented invention, under the Comvik approach distinguishing features which do not contribute to the technicality of the invention are included in the background to the problem to be solved and therefore in effect are “given” to the skilled person. Often the problem may be expressed as “implement a specified non-technical process”. This means that such features cannot be used to establish inventive step. This second “hurdle” represents a higher bar and if all of the distinguishing features of the claimed invention are all found not to contribute to technicality, no inventive step can exist.

However, the technical contribution of claim features is assessed in the context of the invention as a whole. This means that features which alone might be considered non-technical can contribute to the technical nature of the invention (and therefore inventive step) if they interact with other features in the claim in

a technical way.

There have been relatively few board of appeal decisions specifically directed to the patentability of simulations. T 1227/05 was concerned with a resource saving numerical simulation of an electronic circuit. Using the Comvik approach, the technical board determined that a simulation constituted an adequately defined technical purpose provided that the method was functionally limited to the purpose of simulating the circuit. Specifically, the simulation of the electronic circuit's components using differential equations was found to constitute an adequately defined class of technical items, the simulation of which could be a functional technical feature. A technical effect was acknowledged for the simulation even though the invention as claimed did not incorporate a physical end product nor an effect on the real world. Similar reasoning was followed in T 625/11 regarding the simulation of a nuclear reactor to establish a limit value for an operational parameter.

Finally, T 471/05 concerned a method of designing an optical system using an optics design program. Here the method was found to pass the first hurdle of the Comvik approach when limited to implementation by means of a computer program and the details of the optical design process satisfied the second hurdle. From this it can be inferred that the technical board considered the design steps at least interacted with the use of a program to have a technical effect.

The Enlarged Board noted that the relatively small number of decisions directed to the patentability of simulations may be because applicants often choose to avoid the possibility of falling at the second hurdle of the Comvik approach by explicitly claiming a further effect of the simulation on the real world, for example by specifying the controlling of a component based on the output of the simulation. This has led to relatively few decisions directed to claimed simulations per se, hence the need for further guidance.

Questions to be answered

The technical boards of appeal refer a case to the Enlarged Board through a series of questions designed to illustrate the potential divergence in case law. Although the questions provide some initial guidance, the Enlarged Board is free to ignore or rephrase questions as it sees fit. Following some consideration of the meaning of the referring board's questions, the Enlarged Board arrived at the following questions to be answered:

1. In the assessment of inventive step, can the computer-implemented simulation of a technical system or process solve a technical problem by producing a technical effect which goes beyond the simulation's implementation on a computer, if the computer-implemented simulation is claimed as such?
2. For the assessment of whether a computer-implemented simulation claimed as such solves a technical problem, is it a sufficient condition that the simulation is based, at least in part, on technical principles underlying the simulated system or process?
3. What are the answers to the first and second questions if the computer-implemented simulation is claimed as part of a design process, in particular for verifying a design?

To slightly simplify the questions in terms of their potential impact on patent practice, they could be considered as follows:

1. Does claiming a simulation require a direct link with physical reality (i.e. a further claimed step affecting the physical world beyond the computer) to be patentable?
2. If a direct link is not required, can a simulation be patentable due to the use of the technical principles of the underlying system on which the simulation is based?
3. Are the above considerations changed if further non-physical steps are claimed (such a modifying a design based on the simulation result)?

Comments of the Enlarged Board

Technicality

In considering the questions, the Enlarged Board first discusses the meaning of the word "technical", as this concept is fundamental when considering any computer-implemented invention in line with the Comvik approach. The Enlarged Board refrains from putting forward a definition for the term "technical" considering that the term must remain open to allow for potential future new developments. This approach is consistent with previous decisions and unsurprising given the intention for the exclusions of Article 52(2) EPC to be interpreted strictly. Giving a more specific definition of what is technical risks unintentionally excluding future technologies, which the Enlarged Board clearly wished to avoid.

Perhaps setting up for later discussion, the Enlarged Board then briefly considers the general principle that the contribution of a feature to the technical character of an invention is considered over the entire scope of the claim. A feature may only have technical character with respect to part of the claimed subject matter. In these circumstances, to achieve patentability such a claim would need to be limited to only the areas where a technical effect is achieved.

The Enlarged Board then discusses the requirement for a direct link with physical reality. The board stated that they did not see a need to require a direct link with an external physical reality in every case of a computer-implemented invention. The Enlarged Board states that a direct link with physical reality based on features that are per se technical and/or non-technical is in most cases sufficient to establish technicality, but it cannot be a necessary condition. This conclusion is reached based on not wishing to further define the meaning of "technicality", which requiring a direct link would do.

Next, the Enlarged Board considered the concept of a "potential" technical effect. A number of older decisions relate to the concept of data which is intended for use in controlling a technical device. The Enlarged Board states that under the Comvik approach, such potential technical effects may be considered if the data resulting from a claimed process is "specifically adapted for the purposes of its intended technical use". However, it is clarified that such arguments do not apply if the claimed data or data resulting from a claimed process has other potential non-technical uses. This is because the technical effect would not be achieved substantially over the scope of the claims in this case.

The board next considered "virtual" or "calculated" technical effects. Such effects relate to when data is calculated in such a way to correspond closely to real physical entities, but there is no interaction with physical reality claimed. The Enlarged Board states that such effects should be distinguished from "potential" technical effects as discussed above where a computer program or

controlled signal is put to its intended use, as data concerning a physical object can be used in many different ways. The Enlarged Board considers that the broad scope of such a claim with no limitations to specific technical uses would routinely raise concerns that the scope extends to encompass non-technical uses.

One point not considered in detail by the Enlarged Board is the technicality of the underlying system in the referring decision. The referring decision relates to a method of simulating pedestrian flow in a building (and modifying the design of the building based on the results obtained). The simulation includes physical boundaries (such as the walls of the buildings) but also considerations of human behaviour such as “personal space” were included. The referring board eventually accepted this model of pedestrian movement as a technical system based on the suggestion that the movement of people should be considered similar to the movement of particles such as electrons. The Enlarged Board “saw no reason to disagree with this conclusion” perhaps reflecting the board’s approach not to comment on specific technical matters.

Two main thrusts in the approach of the Enlarged Board thus appear out of the above considerations. The first is that providing a definitive rule on what is technical or not is undesirable. The second is that the board considered the application of the claimed simulation to be important, suggesting that limitations to specific applications are perhaps more likely to help with patentability.

Comvik approach applied to computer-implemented simulations

The board divides simulations into two component parts:

- i. an underlying model and any equations representing that model, which are considered to be mathematical regardless of what is being modelled
- ii. the algorithms used to perform the simulation.

The board confirms that, under the Comvik approach, while the laws of the system underlying a simulation are not technical for the purposes of the simulation itself, they may contribute to the technical effects relating to the results of the simulation. Algorithms, on the other hand, would be expected to contribute only if they serve a technical purpose through solving the applicable equations more quickly or reliably.

When considering a simulation with no link to physical reality, the Enlarged Board starts from the assumption that the criteria in the Comvik approach may be applied. The assessment of whether the features of a simulation contribute to technical character is no different to that of a more general computer-implemented method. Here, the board is pointing towards a conclusion that fundamentally simulations are simply a particular computer-implemented method and should be approached in the same way.

The Enlarged Board also comments on the technical nature of the system being simulated. Here the board clarifies that according to the Comvik approach, it is not decisive whether the simulated system or process is technical or not. Instead, it should be considered whether the simulation or process contributes to the solution of a technical problem. The board states that this question has to be answered using the same criteria as other computer-implemented inventions.

This distinction is significant as some had argued that the technicality of the underlying system should be key to considering the patentability of a simulation invention. The Enlarged Board

notes, however, that it is likely that the underlying system will have been known before the filing date of any application directed to simulation of the system. In this case, the underlying system can be considered prior art to the claimed simulation of that system. To achieve patentability, the simulation must therefore make a technical contribution beyond what is already known about the simulated system. If the invention is based on new information as to how the underlying system works, this might amount to a scientific discovery and it would need to be shown that this combined with other features to have a technical effect.

However, the Enlarged Board clarifies that mere calculation of the behaviour of a technical system should not be confused with any technical effect of the simulation of that system. To simulate the system, it must be translated into models and algorithms (which are non-technical information). These models and algorithms therefore define constraints which should be considered in the context of the Comvik approach to see if they contribute to any technical effect.

The Enlarged Board then provides some guidance regarding particular arguments for the technical nature of a simulation, summarising the concepts discussed above:

- The argument that a simulation is technical if the relevant skilled person is a technical skilled person in the field of the simulated system was stated to be suitable in some cases. However, it was noted that this would only likely to be relevant if the simulated system was being improved in some way (otherwise the relevant skilled person would be the skilled person for the simulation).
- Avoiding the need to build prototypes was not considered to be evidence of a technical effect because the building of prototypes is a business decision made by humans. A similar argument applies to decisions that are not technical but might be based on the result of a simulation.
- The argument that the result of simulation itself can be the technical effect was considered suitable if the use of the result (which alone is just data) is at least implicitly claimed.
- The Enlarged Board clarified that the technical principles of the system alone are not necessarily relevant as it is the technicality of the claimed simulation that is relevant when using the Comvik approach. The simulated system is often known and the technical considerations required to understand the simulated system and process are not necessarily relevant to whether the invention solves a technical problem by producing a technical effect.

Conclusions

The Enlarged Board concludes that the Comvik approach is suitable for the assessment of the patentability of computer-implemented simulations. The board considers that, like any other computer-implemented invention, numerical simulations may be patentable and an inventive step can be based on features contributing to technical character of the claimed simulation method.

The board sets out that, when applying the Comvik approach to a simulation, the underlying models form boundaries. The boundaries are not technical in and of themselves, but they can contribute to technicality at least through a) being a reason for adapting the computer or its functioning, or b) if they form the

basis of a further technical use of the outcomes of the simulation. Both of these concepts must be at least implicit in the wording of the claim.

The board also stated that the same considerations apply to a simulation claimed as part of a design process.

Based on this, the board provided the following answers to the referred questions:

1. A computer-implemented simulation of a technical system or process that is claimed as such can, for the purpose of assessing inventive step, solve a technical problem by producing a technical effect which goes beyond the simulation's implementation on a computer.
2. For that assessment it is not a sufficient condition that the simulation is based, at least in part, on technical principles underlying the simulated system or process.
3. The answers to the first and second questions are no different if the computer-implemented simulation is claimed as part of a design process, in particular for verifying a design.

With these answers, the board confirms the patentability of computer-implemented simulations. However, the board does not provide any specifics regarding particular features of a simulation that establish technicality, leaving this to be determined on a case by case basis.

However, the board does confirm that basing the simulation on a technical system alone is not sufficient to establish patentability.

As discussed above, it is the technical effect of the simulation that is considered when establishing inventive step under the Comvik approach. The underlying models may contribute to this technical effect, but this at least depends on an interaction with how the algorithms of the simulation are designed (the operation of the computer) or how the data produced is then used (which must be in a technical way).

Summary

The Enlarged Board has therefore largely confirmed the present approach of the EPO, that the Comvik approach is suitable for determining the patentability of computer-implemented simulations on a case by case basis.

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However, the Enlarged Board has provided some guidance to identifying an inventive step when reviewing simulation inventions for patentability under European practice. To summarise these points:

- A subsequent effect on the real world is a strong indicator of technicality and can provide a latch for other in-principle “non-technical” features to interact in a way that has an overall technical effect. Even if not initially included in the independent claims, such a feature should be included as a dependent claim if possible.
- The technical nature of the underlying system being simulated is not a feature to focus on. While it seems likely that a simulation of a technical system is more likely to produce a technical effect, the technicality of the underlying system in and of itself will not lend to the patentability of simulating that system.
- If a simulation is claimed in terms of the data obtained, there should be at least an implicit link to the use of the data in such a way that a technical effect is achieved.
- If a simulation invention is directed to the algorithms of the simulation, it is likely that patentability will need to rest in an improvement to the functioning of the computer on which the simulation is running.

Considering these points when drafting and filing applications directed to simulation inventions should allow for more straightforward prosecution of simulation inventions in Europe.

Finally, a separate point to consider is the effect (if any) that this decision will have on the approach taken in the UK. This decision represents the second time (the first being [G 3/08](#)) that the Enlarged Board have confirmed that the Comvik approach is the correct way to deal with determining the patentability of computer-implemented inventions. It is commonly accepted that the approach taken by the UK IPO and UK Courts deviates from this practice. In the UK, the “inventive contribution” of the claimed subject matter as a whole is identified and it is this contribution which is analysed to determine if it relates to excluded subject matter or is non-technical. This further confirmation from the Enlarged Board may put more pressure on the UK courts to at least consider whether the approach in the UK is still appropriate.