CA-2024-000036
Appeal No. CH-2022-000144

IN THE COURT OF APPEAL
ON APPEAL FROM THE BUSINESS AND PROPERTY COURTS OF ENGLAND AND WALES
INTELLECTUAL PROPERTY LIST (ChD)
PATENTS COURT (SIR ANTHONY MANN)

B E T W E E N :

EMOTIONAL PERCEPTION AI LIMITED

Respondent

-and-

COMPTROLLER GENERAL OF PATENTS

Appellant

SKELETON ARGUMENT ON BEHALF OF THE APPELLANT

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8th March 2024

Instructed by the Government Legal Department
on behalf of Comptroller General of Patents

Introduction

1. The Respondent, Emotional Perception AI Ltd (the **Applicant**), is the proprietor of patent application No. GB 1904713.3 (the **Application**). By his decision dated 22 June 2022 (BL O/542/22) (the **Decision**), the Hearing Officer (the **HO**) held that the invention claimed in the Application fell solely within matter excluded under section 1(2)(c) of the Patents Act 1977 (the **Act**) as a program for a computer (the **Exclusion**). The Applicant appealed that Decision. The HO rejected the mathematical method exclusion (s.1(2)(a) of the Act), in respect of which there was no appeal.

2. The Applicant's appeal was heard by Sir Anthony Mann. By his order dated 19 December 2023 (the **Order**), and judgment dated 21 November 2023 (the **Judgment;** references: **J/¶**), he allowed the Applicant's appeal and set aside the rejection of Application No. GB 1904713.3 (the **Application**). In summary, the Judge found that the Exclusion was not engaged by the invention claimed by the Application. Had the Exclusion applied, the Judge nevertheless expressed the view that the invention was patentable as a result of having a relevant technical effect.

3. The Appellant, the Comptroller General of Patents (the **Comptroller**) appeals the Order, with the permission of the Judge. The Comptroller advances four grounds of appeal:

   (1) Ground 1: the Judge erred in holding that the exclusion from patent protection for "*a program for a computer… as such*" was not engaged;

   (2) Ground 2: the Judge was wrong to rely on the Appellant's 'concession';

   (3) Ground 3: the Judge was wrong to exclude the consideration of the mathematical method exclusion model; and

   (4) Ground 4: the Judge was wrong to hold that the claimed invention involves a substantive technical contribution.

4. We address Grounds 1 and 4 first, as success on these grounds is sufficient to determine the appeal in the Comptroller's favour. Grounds 2 and 3 provide further support for Ground 1, should the Court consider that to be necessary.

Technical background

5. The Application relates to the field of artificial neural networks (ANNs). ANNs represent an implementation of machine learning technology in the field of artificial intelligence (AI). The name and structure of ANNs are inspired by, and intend to mimic, the inner workings of the human brain, by creating a connection of nodes (or 'neurons'), divided into several layers, through which information is processed from a given input to a desired output.

6. The special characteristic of ANNs rests in their reliance on sets of training data, which the ANN uses in order to adjust its internal parameters (the weights and biases) via a predetermined algorithm, for instance a backpropagation algorithm, in order to generate an output that is as close as possible to the desired output. This process of adjustment is often anthropomorphically referred to as 'learning', but, in reality, it is a simple mathematical process to find the set of parameters (i.e., the weights and biases) for the mathematical model so as to create the desired relationship between the inputs and outputs of the ANN.

7. The Judge provides a short introduction to *"The nature of an ANN"* at J/¶¶14-18. This is sufficiently correct as introductory material for the purposes of this appeal, but we more specifically address the differences between hardware & software, and operational & training aspects of an ANN for the purpose of Ground 2 at [59] *et seq.*, below.

The Application

8. The Application concerns the training and subsequent use of an ANN to provide digital file recommendations of various modalities (in particular, to recommendations of song tracks) based on emotional perception and other subjective characteristics. The invention of the Application was summarised by the Hearing Officer at [8]-[10] of the Decision and by the Judge at J/¶4.

9. There are two independent claims: claim 1 (a product by process claim) and claim 4 (a process (or method) claim). It was common ground that there is no material difference between the claims for the purpose of assessing the extent to which the Exclusion

applies, and both the Hearing Officer and the Judge proceeded on the basis of claim 4. As does the Comptroller on this appeal.

10. Claim 4, broken into appropriate integers, can be found in the Appendix to the Judgment. The Hearing Officer construed claim 4 in the following terms (at [42] of the Decision) which, as the Judge observed (at J/¶23) was not disputed:

> It defines a method in which an ANN is trained on pairs of modally identical files (for example pairs of songs) in order to map the distance between their property vectors in property space towards the distance between their semantic vectors in semantic space. When an input (for example representative of a user selected song) is presented to the ANN, it generates a file vector in property space for said input. This file vector is then compared to the property vectors of reference files (representative of a library of songs, say) to identify those files having similar vectors in property space to that of the input. Such files will be semantically similar to the input by virtue of the ANN having been trained to map/converge distances in property space towards distances in semantic space (i.e. so that it generates similar property vectors for semantically similar files). A file can then be sent to, and output by, a user device. In this way, it provides a tool for recommending semantically similar files.

11. There can be no dispute that the invention of claim 4 is a computer-implemented invention. The Applicant did not dispute that the contribution did not reside in the NLP (natural language processing – used to find the vectors in semantic space) or the extraction of the measurable features from the files *per se* used to form the inputs to the ANN (which generates the vectors in property space). As the Applicant submitted "*the fundamental insight is in the training of the ANN which analyses the physical properties of the file by pairwise comparisons of training files*".

12. The inventive concept was characterised by the Applicant in the following terms (as recorded by the Judge at [24]):

> …the invention of the Application is an ANN-based system for providing improved file recommendations. The invention may be hardware or software implemented. The fundamental insight is in the training of the ANN which analyses the physical properties of the file by pairwise comparisons of training files. In these pairwise comparisons the distance in property space between the output (property) vectors of the ANN is converged to reflect the differences in semantic space between the semantic vectors of each pair of files. The result is that in the trained ANN, files clustered close together in property space will in fact have similar semantic characteristics, and those far

> apart in property space will have dissimilar semantic characteristics. Once trained the trained ANN can then be used to identify, swiftly and accurately, files from a database which correspond semantically to a target file, and to provide - against [sic] swiftly and accurately - file recommendations to a user device (over a communication network).

The legal framework

13. A patent may be granted only for an invention which satisfies the conditions set out in section 1(1) of the Act. However, various exclusions to patentability are identified at section 1(2) which provides as follows:

> It is hereby declared that the following (among other things) are not inventions for the purposes of this Act, that is to say, anything which consists of—
>
> (a) a discovery, scientific theory or mathematical method;
>
> (b) a literary, dramatic, musical or artistic work or any other aesthetic creation whatsoever;
>
> (c) a scheme, rule or method for performing a mental act, playing a game or doing business, or a program for a computer;
>
> (d) the presentation of information;
>
> but the foregoing provision shall prevent anything from being treated as an invention for the purposes of this Act only to the extent that a patent or application for a patent relates to that thing as such.

14. Sections 1(1) and (2) of the Act implement Article 52 of the European Patent Convention (EPC).

The law: the Exclusion and the need for a technical contribution

15. In order to determine whether a claim falls within the scope of the Exclusion, it must be assessed on the basis of 'substance not form'. This principle was first articulated by the European Patent Office (the **EPO**)'s Technical Board of Appeal (the **TBA**) in Vicom T 0208/84 at [16]:

> In arriving at this conclusion the Board has additionally considered that making a distinction between embodiments of the same invention carried out in hardware or in software is inappropriate as it can fairly be said that the choice between these two possibilities is not of an essential nature but is based on technical and economical considerations which bear no relationship to the inventive concept as such.
>
> …

> Decisive is what technical contribution the invention as defined in the claim when considered as a whole makes to the known art.
> …

16. The principle was followed (and thereby incorporated into English law) by this Court in Merrill Lynch [1989] RPC 1 at p569):

> … it seems to me to be clear for the reasons indicated by Dillon LJ that it cannot be permissible to patent an item excluded by section 1(2) under the guise of an article which contains that item – that is to say, in the case of a computer program, the patenting of a conventional computer containing that program. Something further is necessary. The nature of that addition is, I think, to be found in the Vicom case where it is stated: "Decisive is what technical contribution the invention as defined in the claim when considered as a whole makes to the known art". There must, I think, be some technical advance on the prior art in the form of a new result (e.g., a substantial increase in processing speed as in Vicom).

17. The same principle was applied by this Court in Gale's Application [1991] RPC 305 (citing Dillon LJ's judgment in Genentech [1989] RPC 147 (also referred to in Merrill Lynch) and the decisions of the TBA in IBM Corp T22/85 and IBM Corp T65/86). At 325-327, Nicholls LJ held that:

> …In the Genentech case, at page 240, Dillon L.J. said:
>
> > "It would be nonsense for the Act to forbid the patenting of a computer program, and yet permit the patenting of a floppy disc containing a computer program, or an ordinary computer when programmed with the program; it can well be said, as it seems to me, that a patent for a computer when programmed or for the disc containing the program is no more than a patent for the program as such."
>
> It would equally be nonsense, if a floppy disc containing a computer program is not patentable, that a ROM characterised only by the instructions in that program should be patentable. Or, as Fox L.J. said in Merrill Lynch's Application, [1989] R.P.C. 561, 569:
>
> > "...it cannot be permissible to patent an item excluded by section I(2) under the guise of an article which contains that item - that is to say, in the case of a computer program, the patenting of a conventional computer containing that program. Something further is necessary."
>
> This accords with the approach adopted by the European Patent Office. In *IBM Corp./Document abstracting and retrieving (Decision T22/85),* [1990] E.P.O.R. 98, the Technical Board of Appeal rejected an application for a patent related to a method for automatically abstracting and storing documents in an information storage and retrieval system and to a corresponding method for retrieving a document from the system. The board

held that any new concept in the application could lie only in the prescribed procedures, and those procedures or rules had no technical character but were of a purely intellectual nature. In paragraph 14, the board added:

> "The foregoing considerations have been made mainly on the basis that the claimed systems and methods would involve a conventional computer controlled by a software program... Analogous considerations, however, apply in the case where the control of the computer would be effected by hardware (specifically designed logical means), an option also falling within the scope of the claims, as the choice between the two possibilities is not of an essential nature but is based on technical and economical considerations which bear no relationship to the inventive concept as such."

Likewise, and even more recently, in *IBM Corp/Text processing (Decision T65/86)* , [1990] E.P.O.R. 181, 188, the Technical Board of Appeal said: 25

> "Since the only conceivable use for a computer program is the running of it on a computer, the exclusion from patentability of programs for computers would be effectively undermined if it could be circumvented by including in the claim a reference to conventional hardware features, such as a processor, memory, keyboard and display, which, in practice, are indispensable if the program is to be used at all."

…

I approach the substantial issue in this case, therefore, on the footing that it is convenient and right to strip away, as a confusing irrelevance, the fact that the claim is for "hardware". The claim in the specification is, in substance, a claim to a series of instructions which incorporate Mr. Gale's improved method of calculating square roots. It is a claim to electronic circuitry in the form of a ROM which is only distinguishable from other electronic circuitry in the form of a ROM by the sequence of instructions it contains. As such those instructions are not patentable, because they constitute a computer program.

18. That judgment was endorsed by Parker LJ and the Vice Chancellor who held (at 333):

> Turning now to the issues in this case, in my judgment the following propositions are established:
>
> (1) Anything excluded from being an invention by section 1(2) of the Act ("excluded matters") cannot qualify as being patentable within section 1(1) by being incorporated in a product or process unless such product or process is either itself novel or produces a technical result which is novel;
>
> (2) The incorporation of a discovery which is an excluded matter in a product or process does not render it patentable if the only effect of such incorporation is to produce something which is itself an excluded

> matter e.g. the trading system in Merrill Lynch's Application, [1989] R.P.C. 561.
>
> (3) A computer program is an excluded matter whether the program is on a disc (software) or in the hardware (a ROM): Genentech Inc.'s Patent, [1989] R.P.C. 147 per Dillon L.J. at 240; IBM Corp./Document abstracting and retrieving (Decision T22/85), [1990] E.P.O.R. 98; IBM Corp./Text processing (Decision T65/86), [1990] E.P.O.R. 181.
>
> Mr Gale's discovery is a computer program (an excluded matter) incorporated in a ROM which is a device of no inherent novelty. The mere incorporation of the program in the ROM does not alter its nature: it remains a computer program. A computer program remains a computer program whether contained in software or hardware: proposition (3) above. Moreover the result of the incorporation of Mr Gale's "method of calculation" or "computer program" (both excluded matters) only produces another excluded matter, viz. a computer program: proposition (2) above. That is enough to decide this case.

19. The 'substance not form' test is part of the assessment of step 2 of Aerotel v Telco Holdings [2006] EWCA Civ 1371. Having determined that a claim is to a computer program as a matter of substance not form, whether the Exclusion applies depends on whether or not there is a technical contribution. This is clear from [43]-[44]:

> 43. …How do you assess the contribution? Mr Birss submits the test is workable - it is an exercise in judgment probably involving the problem said to be solved, how the invention works, what its advantages are. What has the inventor really added to human knowledge perhaps best sums up the exercise. The formulation involves looking at substance not form - which is surely what the legislator intended.
>
> 44. …In the end the test must be what contribution has actually been made, not what the inventor says he has made.

20. In HTC v Apple [2013] EWCA Civ 451, Kitchin LJ reiterated the 'substance not form' approach (at [37]) and explained that following the Aerotel approach a claimed invention whose only contribution is not technical or lies in excluded subject matter will be rejected under the Exclusion (at [41]). He went on to consider how to determine whether an invention has made a technical contribution at [45]-[51] and explained that the five 'signposts' in AT&T Knowledge Ventures [2009] EWHC 343 (Pat) provide useful guidance, although such are not determinative and, indeed, not all signposts will be relevant to every case.

21. Finally we note that the technical effect in question can be either internal or external (as per Symbian v Comptroller General [2008] EWCA Civ 1066 at [58]), but it needs to be a relevant technical effect. This qualification needs to be made in order to avoid the pitfall of too easily ascribing a technical effect to inventions which involve programs for computers for the simple reason that they seem "technical" in the usual sense: see Protecting Kids the World Over [2011] EWHC 2720 (Pat) at [14].

22. The position on the authorities is clear, irrespective of the form in which the invention is claimed (or can be implemented) if in substance the claim is to a computer-implemented invention (i.e. an invention performed by a computer program) then the Exclusion is engaged. The allowability of that claim must then be decided by determining whether or not it reveals a technical contribution. There is nothing wrong with computer-implemented inventions (whether or not they incorporate an ANN) that make a relevant technical contribution; the exclusion catches those computer-implemented inventions (with or without an ANN) which do not make a relevant technical contribution and which are accordingly a *"computer program…as such"*.

Ground 1: the Judge erred in holding that the exclusion from patent protection for "a program for a computer… as such" was not engaged

23. By this Ground, the Appellant challenges the Court's conclusions (at [61]) that claim 4 (and, implicitly, claim 1) is not a claim to a computer program at all, that the Exclusion is therefore not engaged, and (at [62]) that as a matter of law, it was therefore not necessary to consider the question of technical contribution.

24. As the Judge correctly recognised:

    (1) the claims define a computer-implemented invention and the ANN included in the claims may be embodied in software or hardware (J/[22]); and

    (2) the ANN defined in the claims may take the form of a dedicated hardware unit (in the case of a hardware embodiment) or it may be implemented ("*emulated*") by running appropriate software on the general-purpose computer which is the subject of the claims (in the case of a software embodiment) (J/[23]).

25. A computer-implemented invention, when claimed as such, seeks protection for embodiments implemented in hardware, in software, or in a combination of hardware or software. The principle of 'substance not form' means it is inappropriate to make a distinction between embodiments of the same (claimed) invention carried out in hardware or software, as what is decisive is the substance of the claimed invention (i.e. whether it reveals a technical contribution) not its form (i.e. whether it is hardware- or software-implemented).

26. The Judge appeared to recognise (at least implicitly) that a claim to a computer-implemented invention (protecting hardware and software embodiments) should be assessed as a matter of substance not form when applying the exclusion to a program for a computer (J/[56] and [78]). However the Judge did not apply this principle.

27. The actual approach taken by the Judge is difficult to discern from the Judgment. Rather than seek to identify and assess the substance of the invention, the Judge adopted an alternative approach assessing the hardware and software implementations separately in each case assessing whether the Exclusion was engaged by reference to the identification of a 'computer' and 'computer program' to which the Exclusion could apply.

28. We attempt to summarise the Judge's approach below:

    (1) Rather than determine the appeal on the basis of the Grounds of Appeal advanced by the Applicant, the Judge decided instead to ascertain whether or not the Exclusion was engaged by asking himself what was the 'computer' and what was the 'program' said to engage the Exclusion (J/[32]). As this question only arose after the hearing, the Judge requested sequential written submissions from the Comptroller and the Applicant respectively.

    (2) Having found that a computer is involved in both the hardware- and software implementations, the Judge proceeded to disregard the hardware implementation on the basis of (a mischaracterisation and misunderstanding of) the Comptroller's 'concession' (addressed in more detail in relation to Ground 2) (J/[43]-[47]).

(3) Insofar as the software implementation is concerned, the Comptroller submitted that there are two programs involved: (i) at the training stage and (ii) in the computer which operates the trained ANN. The Judge agreed with (i) but not (ii) (J/[48]-[49] & [57]). Rather, the Court found that the software-implemented ANN can be "*decoupled*" from the computer software emulating the ANN (J/[56]-[59]), that the remaining decoupled ANN operates in the same way as the hardware ANN and that, extrapolating from his interpretation of the Comptroller's concession, the decoupled ANN does not represent a program for a computer.

(4) The Judge therefore concluded that the only program involved in the invention is the training program (J/[59]), which "*involves setting the training objectives in terms of the structure of the ANN (the software) and the training objectives*" (J/[60]).

(5) The Judge concluded that the training program is only a subsidiary part of claim 4 and therefore that the Exclusion is not engaged because "as a matter of construction the claim is not to a computer program at all" (J/[61]).

29. Having erroneously found that the Exclusion is not engaged at all solely on an assessment of the technical constituent elements of the different forms which the claimed invention can take, the Judge stated (at [63]) that it was not necessary, as a matter of law, to consider the question of whether the actual contribution of the invention in claim 4 is technical in nature.

30. In the circumstances in which a claim is directed to a computer-implemented invention (irrespective of whether that includes an ANN), the invention being implemented in hardware or software (or a combination thereof), the Judge should have disregarded the possible alternative form implementations and should have held that the claims were directed to "*a program for a computer … as such*", that the Exclusion was engaged, and that the question of technical contribution should be asked.

31. We have set out the construction of claim 4 and the alleged inventive contribution above. The substance of the invention resides in the training of the ANN. This is

recognised by the Applicant, who submitted that the "*fundamental insight is in the training of the ANN*" i.e. the use of a training program providing a training method (pairwise comparison) and objective (converging distances).

32. That the training program is the substance of the contribution can also be determined by looking at the claimed invention itself. Claim 4 covers a method of providing semantically relevant file recommendations in a system. The system is simple to deconstruct into its constituent elements. It consists, in the training phase, of (1) a training program, with accompanying training data on which the instructions are run, and (2) an initially untrained ANN. Once the ANN is trained, the system consists of (1) the trained ANN, (2) a database of files on which the trained ANN operates, (3) target data given by the user, (4) a communications network, and (5) a user device.

33. Simply put, everything else in this system apart from the training program is already well-known in the field. The application is silent as to any specific details of its implementation. As the Hearing Officer noted at [50]-[51], this is not a case where the contribution resides in the hardware *per se*. Nor does the contribution reside in the NLP (natural language processing) or the extraction of the measurable features from the files *per se,* for both of which off-the-shelf software is taught to be used.

34. Accordingly, once the claimed method is stripped (as it must be) of its form, those characteristics which are common to any (or at least most) ANNs, and the network, media file database and user device (all of which are known in the art), all that is left is the training program. That is, in substance, the contribution of claim 4.

35. Having construed claim 4 as a claim to a computer-implemented invention that includes an ANN, and having identified the actual contribution of the invention in claim 4 as being the training of the ANN as per [34] above, the Judge should have concluded that claim 4 is a claim to a program for a computer as such and the Exclusion is therefore engaged. The Court should then have proceeded to assess whether the actual contribution so identified is technical in nature, pursuant to Aerotel step (4).

36. Further, insofar as the Judge found (contrary to the HO and the Applicant's Appellant's Notice) that the ANN could be 'decoupled' from the computer software emulating the

ANN (as he did at J/[58]), the Judge should have held that the 'decoupled' ANN was excluded as a mathematical method. This is addressed in Ground 3.

37. Yet further, the Judge was wrong to rely in his assessment of the Exclusion (as he did at J/¶56) on the Comptroller's 'concession' as regards hardware implemented ANNs as a basis for holding that the software implemented ANN is not operating a program. This is dealt with in Ground 2.

Ground 4: the Judge was wrong to hold that the claimed invention involves a substantive technical contribution

38. The only part of the invention relied upon by the Applicant as being relevant to any question of technical contribution was *"the sending of a message over a communications network"* (Applicant's Skeleton below at [122]). The Judge held (at J/¶76) that the file transmission was capable of constituting a 'technical' contribution because the file had been identified and moved "*because it fulfilled certain criteria*".

39. The actual transfer of the media files selected from a database to the end-user is done in an entirely conventional way. There is no teaching in the specification as to how it is to be done, so it must be CGK. So it is the criteria that need to be considered.

40. Having recognised that the criteria by which media files are selected for recommendation by the ANN are "*not technical criteria in the sense that they can be described in purely technical terms*" (J/¶76), the Judge should have concluded that the criteria provide an answer to a subjective (i.e. not technical) problem on behalf of the end-user, and that the contribution (if any) of the Application is therefore incapable of giving rise to a technical effect.

41. That *the fulfilment of subjective criteria cannot constitute a technical contribution* is consistent with Merrill Lynch, in which the justification for a technical contribution was the need for "*some technical advance on the prior art*" (see the passage cited above). Once the actual contribution of the claim, properly construed, is stripped of any excluded subject-matter, there must be 'something else' left which justifies granting the applicant the requisite patent monopoly. This must be correct, or else any claim which is, for instance, a claim to a computer program as such could escape

the Exclusion simply by, for example, outputting a file. The law is seeking to reward inventions, by which it means that 'something else' which is a technical advance over the prior art.

42. The EPO does not consider subjective criteria to fulfil a technical purpose. In Yahoo! T 0306/10 (in considering inventive step) the EPO held (at [5.2]):

> In the Board's view, the selection of an item, for example a song, for recommendation to a user does not qualify as a technical purpose. From a technical point of view it is irrelevant what songs are recommended to a user. While making "good" or "bad" recommendations may lead to different user reactions and thereby, in the end, to different technical results (the user might for example play more or fewer songs, or issue more or fewer search queries in order to find other songs), such results do not qualify as a technical effect of the recommendations, as they depend on subjective choices made by the user (cf. decision T 1741/08 of 2 August 2012, reasons 2.1.6).

43. Further in Designing of Building Structures/ENU T 1567/05 in the context of the presentation of information exclusion of Art 52(2)(d), it was held (at [3.5]-[3.6]):

> 3.5 Nor does the choice of information to be presented have a technical effect. Article 52(2)(d) EPC does not distinguish between different kinds of information. Therefore the presentation (as such) of any information must be regarded as a "non-invention". It is thus irrelevant that the present invention is arranged to display the largest stress value for each building structural component (rather than some other stress value). Although relating to technical phenomena, the stress values are mere pieces of information aimed exclusively at the human mind. It follows that also the features determining the kind of information displayed do not contribute to an inventive step.
>
> 3.6 The above conclusion is supported by the observation made in the description (paragraph [0004]) to the effect that stress values displayed in the form of numerical data are difficult to understand. This will however depend on the person studying it. An engineer would readily understand numerical values and might prefer them to colours since they are more exact and allow an in-depth analysis, whereas a layman satisfied with a quick overview might prefer colours, especially if these have been chosen in a conventional way (eg red for critical components; cf paragraph 1 above). The problem indicated in the description is thus not of a technical character because it depends on the skills and preferences of the particular group of users for whom the invention is intended.

44. There is no reason of policy or principle why the subjective preferences of users would be of technical character in the case of the Exclusion, where they do not so qualify for

the presentation of information exclusion. On the contrary, considerations of consistency would require the Court to adopt the same approach.

45. At [76] the Judge drew support for his finding that the transfer of a file "*because it fulfilled certain criteria*" could amount to a technical contribution from the decisions in Gemstar v Virgin Media [2009] EWHC 3068 (Ch) and Protecting Kids. However, both these cases provide further support (albeit implicitly) for the proposition that subjective criteria cannot constitute a technical function.

46. Gemstar concerned three patents relating to electronic programming guides (EPGs). The first patent concerned a method for navigating around TV programmes. It claimed a specific grid format in which the programmes were displayed on the TV screen in the EPG (see [38]-[39]). The second patent similarly provided for an improved television schedule system and process based on favourite channels (see [141]-[142]). The third patent, however, was more complex. It assumed the existence of a set-top box capable of receiving and recording TV programmes and of displaying an EPG, the latter of which was used to control and programme the recording of TV shows in the known way. The alleged invention rested in the additional facility in the EPG which provided a means of controlling the transfer of an already recorded programme to a secondary recorder (e.g. a VCR).

47. In relation to the first two patents, Mann. J found that they covered inventions which were programs for a computer as such and were therefore excluded from patentability. In respect of the first patent, Mann J held (at [50]) that:

> The technical effect relied on by Gemstar is a better interface, or a different interface if "better" is not relevant. That is an abstract concept. It does not in terms describe some physical activity or effect. There is a different display on the screen, but that is not enough, in my view. That is still part of the computer program and is not an external effect (Mr Birss did not rely on any internal effect). Many computers running a program are likely to have a display output, and if that were enough to be a technical effect then every program in such a computer would be likely to fall outside the exclusion, which is unlikely to have been the intention of the draftsman of the act. A different display to that shown before does not seem to me to go far enough to amount to a technical effect which makes a difference. Mr Birss describes the technical content as being a better user interface (usually) or a user interface (sometimes). That way of describing it does not overcome the difficulty he faces. Ultimately they

> are both ways of describing, in different terms from the patent, what the invention is said to achieve. But they are both judgmental, the first more so than the second. The fact that what the user perceives and interacts with is "better" does not make the advance technical at all (nor is it part of the claims). Nor does characterising it as an interface give it a technical effect that it would not otherwise have had. One has to look to see what the effect actually is, and in my view it is not technical. In fact, in the sense in which Mr Birss uses the expression, "interface" confirms this – it is an abstract, not a physical, concept.

48. Similarly, for the Second Patent he held (at [147]):

> This seems to me plainly to be a computer program. It is a program which takes data, makes a display, permits visual and internal tagging, and then displays a subset of that data. So there is little doubt that it is a program. What is the contribution said to be? It was described by Mr Birss as being the improved use of the screen 'real estate' as per the user's interactively applied specification. So it has worked on the data and filtered it. Is that a technical contribution? In my view it is not. It does not make the computer a better computer. It does nothing to make the computer do anything other than to sort some data, and that is not sufficient.

49. However, the third patent was found not to be excluded from patentability, as a result of having an actual technical effect. What distinguished the third patent from the others was the physical effect of transferring data[1]. Mann J held (at [234]):

> Again the question is whether what the invention achieves has a relevant technical effect. This time I think that it does. This is not merely a computer running a program without any effect in what might be regarded as the outside world. While it does not produce a "better computer" it does actually achieve something which can be regarded as a physical effect, namely the initiation of movement of data from one disk to another (both metadata and TV programme content). That seems to me to be enough to prevent it being just a computer program as such and to render it patentable material. It is true that it does not produce an effect outside the system itself, but it is still an effect.

50. Protecting Kids concerned a patent application relating to a system for monitoring the content of electronic communications to ensure that users, especially children, are not exposed to inappropriate content or language. The appeal focused on claim 33, which claimed a data communications analysis engine which samples data packets from a communications channel for further analysis of the content. Once the content is analysed and an alert level assigned, an administrator such as a parent is notified

[1] On this point, see also Lantana v Comptroller [2014] EWCA Civ 1463 at [40]-[41].

and is required to send a command in return (e.g. terminating the electronic communications or shutting down the equipment).

51. In finding that the invention of claim 33 does not lack a relevant technical effect, Floyd J (as he then was) engaged in the following analysis (distinguishing the first two Gemstar patents) (at [34]-[35]), re-iterating that the starting point for a generated and transmitted file is that it is not a relevant technical contribution:

> 34. …I start with the proposition that the generation and transmission of an alert notification to the user/administrator is not a relevant technical process. I accept that in many cases this may be correct. Plainly it was correct in the case of two out of the three patents considered by Mann J. in Gemstar, where information was simply displayed on a screen. But what is in play in the present case, namely an alarm alerting the user, at a remote terminal such as a mobile device, to the fact that inappropriate content is being processed within the computer, is in my judgment qualitatively different. First of all, the concept, although relating to the content of electronic communications, is undoubtedly a physical one rather than an abstract one. In that respect it was more akin to the third of the three patents considered by Mann J. in Gemstar. Secondly, the contribution of claim 33 does not simply produce a different display, or merely rely on the output of the computer and its effect on the user. The effect here, viewed as a whole, is an improved monitoring of the content of electronic communications. The monitoring is said to be technically superior to that produced by the prior art. That seems to me to have the necessary characteristics of a technical contribution outside the computer itself.
>
> 35. Accordingly I would hold that the contribution of claim 33 does not reside wholly within the computer program as such exclusion. I think that conclusion is in accordance with the AT&T signposts. In particular I would say that the invention solves a technical problem lying outside the computer, namely how to improve on the inappropriate communication alarm generation provided by the prior art. That is sufficient in my judgment to overcome the objection on the very specific facts of the case before me.

52. We mention that an alternative approach supported in the authorities arises where a technical solution which is not itself intrinsically objective or technical satisfies the technical contribution threshold if the contribution, as a whole, addresses a technical problem. As stated by Kitchin LJ (as he then was) in HTC v Apple at [49]:

> … it is also helpful to consider whether the invention may be regarded as solving a problem which is essentially technical, and that is so whether that problem lies inside or outside the computer. […] An invention which solves a technical problem outside the computer will also have a relevant technical

> effect, for example by controlling an improved technical process. In either case it will not be excluded by Art 52 as relating to a computer program as such.

53. We mention this for completeness and also because it appears at least possible that both the third patent in Gemstar and claim 33 of Protecting Kids could equally be justified on the 'solving a technical problem' approach.

54. Whichever way the third patent of Gemstar and claim 33 of Protecting Kids are assessed, the alleged technical effect of the present invention differs from them both.

55. First, the effect of the present invention does not include any physical consequences (the transfer of pre-existing data to the user is entirely conventional and, as such, is not part of the inventive contribution). None of the data, the method of communication, nor the communications network itself is the subject of the invention. It only involves delivering to the user device a recommended media file, which has been selected from a database by, essentially, a process of data analysis.

56. Second, the effect of producing a file with subjective attributes which may have an effect on the user (in that the user enjoys the recommendation, or, more generally, certain emotions are triggered in response to that recommendation) is not similar to the wider effect of improving the monitoring of content. The effect of the application in Protecting Kids was not simply the transmission of an alert to the parent – it was the fact that, by searching the electronic communications for inappropriate content, informing the parent of such content and then acting according to a command given by the parent in response, an entire system is created, which is meant to ensure an overall improved monitoring process (thereby solving a technical problem). There is no equivalent in the present case. Indeed, the Judge rightly held that the user does not even need to listen to the song (J/¶76). There is no wider system, the only effect is the delivery of a recommended file with certain (subjective) characteristics.

57. Indeed, it is notable that the Judge never explained what he meant by *"because it fulfilled certain criteria",* beyond accepting (J/¶76) that the criteria *"are not technical criteria in the sense that they can be described in purely technical terms, but they are criteria nonetheless".* Nor did he seek to suggest that there was any technical problem

which the invention was solving. In short, he found that a non-technical problem was being solved by the technical apparatus of an ANN-based computer.

58. Had the Judge not erred as he did in respect of Grounds 1 and 4 above, he should have found that the Application is a computer-implemented invention that does not disclose a substantive technical contribution and is therefore excluded from patentability as a program for a computer under section 1(2)(c) of the Act.

Ground 2: the Judge was wrong to rely on the Appellant's 'concession'

59. Following the hearing, further written submissions were requested by the Judge in his note of 15 September 2023, and were submitted sequentially on 22 and 27 September by the Comptroller and the Applicant respectively (see J/¶32-33).

60. The main questions which the further submissions addressed, as set out by the Judge, were (1) what is the relevant 'computer' for which there is a relevant program? and (2) what is the program within that computer to which the exclusion applies? The Comptroller therefore had to engage in an artificial distinction between the hardware and software implementations in order to address these questions. Its position was summarised by the Judge at J/¶33.

61. By their Submissions the Comptroller stated (at [3]): "Insofar as the invention is implemented in hardware form (such as where the ANN is embodied on special-purpose electronic circuitry that does not rely on executable instructions and/or hardware on an integrated circuit), the relevant "computer" is the hardware (i.e. the special-purpose electronic circuitry) on which the ANN is created, trained and ultimately implemented." And (at [5]): "Insofar as the invention is implemented in hardware form, there is no relevant computer program to which the exclusion applies. In the premises, had the invention been limited to a 'hardware-only' implementation, it is unlikely that the computer program exclusion would have been engaged." Here, the Comptroller was conceiving that it is possible for an invention to lie in 'better hardware' for implementing ANNs generally, i.e., an "architecture", "operate in a new way" and/or "better computer" (AT&T signposts 2, 3 and 4). This appears to have led to a material misunderstanding by the Judge.

62. The Judge, encouraged by the Applicant ([2(b)] of the Applicant's Submissions) seems to have thought that the Comptroller was saying (in the words of the Applicant) that *"a hardware ANN is itself a computer, albeit they say a computer with no program"*. That is not what the Comptroller intended and, so interpreted, is a complete nonsense. As the Applicant said *"This is an unsupported notion that is obviously wrong: computers are devices for executing computer programs"*. We entirely agree.

63. Irrespective of the possible interpretations of the Comptroller's Further Submissions, given the importance of this case, the Comptroller makes clear his position as follows:

(1) **A hardware ANN**: the hardware itself is a computer which has a specific hardware architecture. Rather than the architecture familiar to conventional computers (as described by this Court in *Gale* at 320 lines 29 to 321 line 30), as the Judge explained [J/15] a hardware ANN computer has *"layers* [of neurons] *connected to each other, or at least some others, and to layers below…one feeds data in at the 'top' and it is processed down through the layers in accordance with the states of the neurons, each applying its weights and biases and passing the result on, until the result of the processing is reflected in an output at the bottom."*

(2) **The program for an ANN:** the ANN hardware is a known mathematical model which can be 'trained' to perform a specific application. In order to customise the generic hardware for a particular application, it is the set of 'weights and biases' (which the Judge referred to as the "network parameters", J/¶17) which have to be configured. It is the set of weights and biases which therefore form the 'program' of this unconventional computer. This accords with the definitions of a computer program in the Cambridge, Collins English Dictionary and Macmillan dictionaries, quoted by the Judge at J/¶36: *"a set of instructions that makes a computer do a particular thing"*; *"a set of instructions for a computer to perform some task;* and *"a set of instructions stored inside a computer that allows the user to do a particular thing…"*. The definition in the Free Dictionary is not satisfied as this includes *"a sequence of instructions…"* and is clearly limited to the concept of traditional sequential computing. ANNs

are a different architecture to a sequential computer, but the Exclusion is not limited to any particular architecture.

(3) **Software ANNs:** As the Judge held at J/¶18: *"…an ANN can also exist in a computer emulation. In this scenario a conventional computer runs a piece of software which enables the computer to emulate the hardware ANN as if it were a hardware ANN. Professor Pardoe explains that this is slower than a dedicated hardware ANN. However, it has the same effect. It should be appreciated that there is…a distinction between the underlying software on the computer which "creates" the emulated ANN, and the emulated ANN itself."* We agree, in the case of a 'software ANN' there are two programs: (i) the generic software which emulates the hardware; (ii) the set of weights and biases which constitute the ANN programming, as in a hardware ANN.

(4) **ANN Training Software:** The ANNs discussed above are in the 'operating' or 'inference' stage (see J/¶27 – which distinguishes between the *"inference stage"* where the trained ANN is operating, and the *"training stage"* where the weights and biases are determined). In the training stage, additional software is used, together with a set of training data for which the desired output is known, to evaluate a cost function to incrementally change the sets of weights and biases (see J/¶16). The basic training program is a known algorithm, but the necessary configurations (inputs, training set, cost function etc.) are determined by the person seeking to train, or program, the ANN (see J/¶25). The ANN being trained may be a hardware or emulated (software) ANN.

(5) **Hard-coded ANNs:** Just as it is possible with a conventional computer to permanently fix the program in the computer (e.g. like the programmed ROM in Gale), it is possible to hard-program a particular set of weights and biases (i.e., the program) in a hardware (or software) ANN, e.g., for permanent applications such as in a dishwasher or toaster. No such 'permanent programming' has been considered to avoid the Exclusion for conventional computing architectures, and there is no basis for a different approach in ANN-architecture computers.

64. As will be apparent from the above, the Comptroller's position is that: (1) **all** ANNs are computers (hardware or emulated); (2) **all** ANNs in the inference stage have a program: the set of weights and biases; (3) for emulated ANNs, there is additional generic software for emulating the ANN on a conventional computer; and (4) in the training stage there is additional software to perform the training function.

65. The Comptroller did not concede, and nor did it follow from their submissions, that a computer-implemented invention (whether or not it involves an ANN), whose claim necessarily encompasses software executed on a general-purpose computer, is outside the scope of the exclusion. Indeed the Comptroller submitted (at paragraph 5) that "…*where (as here) the claim covers both hardware and software implementations then the software implementation should be assessed according to the guidelines set out above in respect of computer-implemented AI inventions*". The Application is not to 'hardware' or 'software' but to a computer-implemented ANN.

66. Further, the Judge's conclusion is based on the false premise that the software form of the ANN (in the inference stage) "*is not implementing a series of instructions pre-ordained by a human*" (see J/¶54). As we have made clear, an ANN (whether hardware or software) in the inference stage has such a computer program. The Judge gives no justification for his implicit contention that such program itself must be *"pre-ordained by a human"*. Insofar as he is however right, the program that results from the training activity (put in place by a human) is no less a work derived by a computer (in this case, the training program) under the direction of a human, than an ordinary machine-code program used to program a conventional computer having itself been derived by a computer (in the normal case, a compiler program) under the direction of a human. Both start with human input and configuration and use an intermediate computer system to generate the final program. No proper distinction exists.

67. Even if the Judge had been right to try to dissect the claim into computers and instances of program, the Judge should have found that at least two relevant programs exist in the context of the ANN alone. Namely, the final program causing the ANN to evaluate the property vector; and the training program. Additionally, there is a program involved in using the property vector to make a file selection, and

(in a software implementation) a further program for the emulation of the ANN. Had the Judge taken his own course properly, he would have found the Exclusion engaged.

Ground 3: the Judge was wrong to exclude the consideration of the mathematical method exclusion model

68. The Hearing Officer held (at Decision, [63]) that insofar as the ANN can truly be decoupled from the software platform that supports it in the way that the Applicant suggested, then it relates wholly to a mathematical method and is therefore excluded from patentability under section 1(2)(a) of the Act:

> I am not persuaded that the ANN can truly be decoupled from the software platform that supports it in the way Mr Chacksfield suggests. However, even if it can, it is important to consider what an ANN is at this level of generality. It is an abstract model which takes a numerical input, applies a series of mathematical operations (applying weights, biases and an activation function), and outputs a numerical result at successive layers. A claim to an ANN or the algorithm by which it is trained, in a general and abstract sense, related wholly to a mathematical method and it fails at step 3. …

69. The Applicant sought to rely (at [107] of its Skeleton Argument below) on the HO's finding that the mathematical method exclusion did not apply because the ANN could not be decoupled from its specific application. The Comptroller accepted the HO's decision on mathematical method (hence, no Respondent's Notice).

70. When the Judge implicitly suggested by his post-hearing 'Note to Counsel' that (irrespective of the Applicant's Appellant's Notice), he was potentially considering decoupling the ANN from the rest of the claim, the Comptroller sought to caution the Judge that he risked walking onto the mathematical method exclusion:

> As to the ANN itself, in a general and abstract sense (i.e. stripped of the software by which it is trained and/or implemented), as the Hearing Officer held (at [63]), that is simply an algorithm and, as such, relates wholly to a mathematical method and is excluded from patentability on that basis.

71. In response, the Applicant said this point could not be taken on a procedural basis because the Comptroller had no Respondent's Notice. The Judge accepted the Applicant's contention stating (at J/¶82) that if the Comptroller "*wished to run it as an alternative [the Comptroller] should have served such a notice*".

72. This misses the point. The Comptroller was not running the point as an alternative. He was cautioning the Judge as to the consequence of an approach which the Judge appeared to be contemplating notwithstanding that (for very good reason) the decoupling point was not being advanced by the Applicant on the Appeal.

73. Before this Court, the Comptroller advances the same position: the Court, proceeding in accordance with the substantive law on exclusions, should not decouple the ANN from the invention as a whole. However, if the Court is minded to do so (such that the programmed ANN alone is the technical contribution) then the Court must separately reconsider the HO's decision on mathematical method exclusion; the HO rejected the applicability of the mathematical exclusion only because the method had to be viewed in the context of the invention as a whole.

74. The Comptroller's position is that an ANN, whether programmed (i.e., with weights and biases set) or unprogrammed is nothing more than a mathematical method.

The approach in the EPO

75. For completeness we summarise the approach of the EPO to assessing computer-implemented inventions under Art 52 EPC, and ANN inventions more generally.

76. In assessing computer-implemented inventions the EPO adopts a 'two-hurdle' approach which incorporates its so-called 'COMVIK', a modified problem-solution approach for assessing inventive step. The approach is summarised in the leading case of G 1/19 (Pedestrian Simulation) at [37]-[39] and [78]-[79], reproduced below:

> 37. To be patentable, any invention has to pass the eligibility test under Article 52 EPC (i.e. it must not fall under the "non-inventions" mentioned there) and also fulfil the other criteria listed in that article (novelty, inventive step, etc.). For computer-implemented inventions, the twofold test for patent eligibility and for inventive step (using the COMVIK criteria) is often referred to as the "two-hurdle approach" …
>
> 38. It may be that a shift has taken place in the relative level of each of these two hurdles in the sense that it has become easier to clear the eligibility hurdle of Article 52 EPC (see point B.II.a above) and more difficult to pass the inventive step hurdle (see point B.II.b above) of Article 56 EPC. As result of this shift, it could be said that there is now in effect an additional intermediate step to assess the "eligibility of the feature to contribute to inventive step".

> 39. The two-hurdle approach for computer-implemented inventions actually entails three steps. Establishing whether a feature contributes to the technical character of the invention constitutes an intermediate step between assessing (i) the invention's eligibility under Article 52 EPC, and (ii) whether the invention is based on an inventive step vis-à- vis the closest prior art. This additional intermediate step serves as a filter for features contributing to a technical solution of a technical problem in view of the closest prior art. Only those distinguishing features can contribute to inventive step.
>
> …
>
> 78. Patent eligibility, the first hurdle, is to be assessed under Article 52 EPC without considering the prior art, i.e. without regard to whether computers existed at the priority date of the invention. The use of a computer in the claimed subject-matter therefore makes it eligible under Article 52 EPC (point B.II.a above).
>
> 79. For the second hurdle, the prior art is to be considered. Inventive step is based on the difference between the prior art and the claimed subject-matter. The requirement that the features supporting inventive step contribute to a technical solution for a technical problem means that the invention, understood as a teaching based on existing prior art, has to be a "technical invention". The use of a general-purpose computer always constitutes prior art in this context. The invention to be assessed under this provision needs to be "technical" beyond the use of a general-purpose computer. For this assessment, the definition of a technical invention in Article 52 EPC, in particular the list of "non-inventions" in Article 52(2) EPC, can be useful for determining whether specific features contribute to inventive step (see G 3/08, Reasons, point 10.13.1).

77. Although the EPO approach combines the assessment under Art 52 with that under Art 56 (inventive step), ultimately both the UK and EPO approach seek to determine whether or not there is a non-excluded technical contribution.

78. Further, the EPO's Guidelines for Examination (G-II 3.3.1) take the view that 'neural networks' are based on computational models and are inherently mathematical in nature. Thus, at the EPO, ANNs necessarily engage the program and the mathematical method exclusions. Thus, computer implemented claims incorporating ANNs will only be patentable if they have a relevant technical effect such that a technical problem is solved in a non-obvious way. See also Mitsubushi T 0702/20 at [10]-[11].

79. The Comptroller does not submit that the UK should adopt the EPO approach, for to do so would require the amalgamation of the assessment of excluded subject matter with inventive step (which has long been eschewed by the UK Courts). But, the

Comptroller observes that the Judgment creates a substantial inconsistency with the EPO approach and the existing domestic approach, which highlights the erroneous approach adopted by the Judge.

80. The Judgment effectively provides a carve-out for ANN implemented inventions that is not justified under the EPO or domestic approach to excluded subject matter. This is because any ANN (or invention involving an ANN) may be implemented in hardware. Following the *ratio* of the Judgment, it cannot be excluded as a computer program under section 1(2) – even where (as here) the claim also covers software-implemented embodiments. This cross-check illustrates why the Judgment is wrong.

Conclusion

81. For the reasons set out above, the Court should allow this appeal and reject the Application as being excluded from patentability pursuant to section 1(2)(c) of the Act.

82. The Comptroller's view is that, irrespective of the result in the present Application, the Judgment is at very material odds with the legal approach of the EPO and as previously understood in the United Kingdom. So much so that in the month between the Judgment hand-down and the final Order hearing, the Applicant informed the Court that it had counted no fewer than 77 reports as to the change in the UK's law on the patentability of ANNs. The message received by the industry appears to be that claims covering AI, and in particular ANNs, are not caught by the exclusions on patentability. We conclude with a quote from one such report (from Mewburn Ellis):

> The answers provided by Mann J were at odds with the current approach of the UKIPO to examination of computer implemented inventions, and therefore likely to be surprising for [those] with experience prosecuting patent applications for computer-implemented inventions in the UK.
>
> Mann J considered that the process by which the artificial neural network is trained is a program for a computer as such. However, he considered that, even when implemented in software, the **trained artificial neural network itself is not a program for a computer**, and therefore that the claim as a whole could not fall under the exclusion. …
>
> …if the judgment were confirmed by the Court of Appeal, this could indeed mark the beginning of a more AI-friendly era at the UKIPO, albeit one which might lead to different results from their European counterparts.