



PATENTS ACT 1977

APPLICANT Kinaxis Inc

ISSUE Whether application GB2016046.1 complies with
Section 1(2) of the Patent Act 1977.

HEARING OFFICER Dr Stephen Brown

DECISION

Introduction

- 1 Patent Application GB2016046.1 has a filing date of 9th October 2020. It claims a priority date of 11th October 2019 from US application 16/599143. The GB application was published as GB2590161 on 23rd June 2021. On 2 March 2021, the Examiner issued a Search report under Section 17(5)(b), indicating that the search would serve no useful purpose. The search report was accompanied by an Abbreviated Examination Report setting out objections under Section 1(2). Despite several rounds of correspondence, the applicant was unable to satisfy the examiner that the application met the requirements of Section 1(2)(c) and on 13 July 2022 the Examiner issued a letter suggesting the applicant request a hearing to resolve the matter. The applicant responded on 4 November 2022 with amended claims but did not request a hearing. The application has been passed to me to for a decision based on the papers on file.

The Application

- 2 The application concerns a system which uses machine learning (ML) models to forecast the sales of products.
- 3 Client signal data and external signal data are input into the system. The client signal data may include historical sales data from point-of-sale terminals for various products at various locations and the external signal data may include historical weather data or/and holiday information for each of those locations, for example. The system also receives requests for sales forecasts. Each request may be for a separate forecast for a particular product at a particular location or store.
- 4 The forecast is made by applying a ML model to a data set which is based on a relevant subset of the client data and external data. The ML model used to fulfil a particular request is either i) a new ML model selected from a plurality of ML models

(step 1006 in Fig. 10, reproduced below); ii) a previously selected ML model which has been retrained (step 1016); or iii) a previously selected ML model which is used without retraining (step 1018):

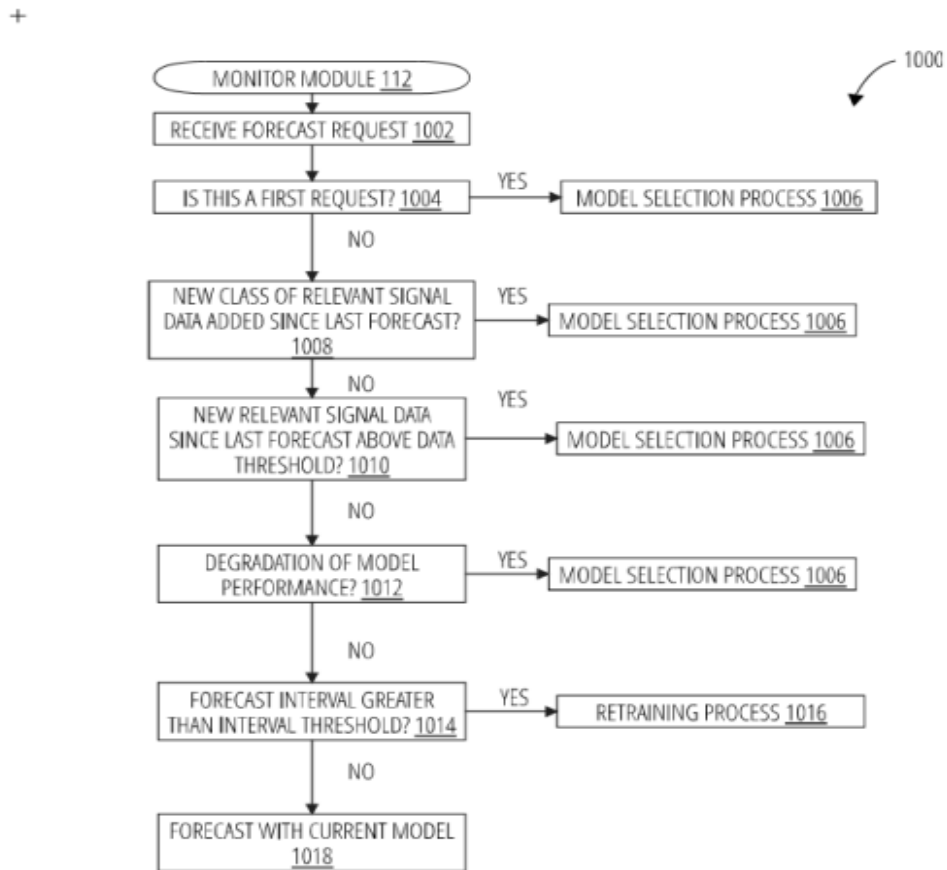


FIG. 10

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- 5 The system selects one of these three options depending on (a) whether a request for a forecast is the first request for a particular product-location combination (step 1004); (b) a new class of data has been added to the data set (step 1008); (c) whether a significant amount of new data (exceeding a threshold level) has been added to the data set (step 1010); (d) whether the performance of a current ML model has degraded (step 1012); and (e) the time interval between a current request and a previous request (step 1014).

6 There is currently only one claim on file. It was last amended on 4 November 2022. This amended claim is reproduced below:

1. A system comprising:

a processor; and

a memory storing instructions that, when executed by the processor, configure the system to:

receive, at an ingestion module, historical data associated with a product;

process, by the ingestion module, historical product data;

provide processed historical product data to a machine learning storage device;

fetch, by an external data module, historical location data associated with the location;

process, by the external data module, the historical location data;

provide processed historical location data to the machine learning storage device;

receive, by a monitoring module, a first forecast request for a forecast of the sales of the product at the location;

determine, by the monitoring module, a forecasting method to make the forecast;

communicate to a forecasting module, by the monitoring module, a command to execute the forecasting method;

access, by the forecasting module, the processed historical product data; the processed historical location data; and one or more machine learning models from the machine learning storage device;

engineer, by the forecasting module, one or more features associated with the processed historical product data and/or the processed historical location data;

provide, by the forecasting module, the forecast based on the forecasting method; and

upload, to the machine learning storage, the forecast; wherein when executing the forecasting method, the instructions configure the system to either:

i) select a machine learning model to make the forecast; or

ii) retrain a previously-selected machine learning model and use the retrained model to make the forecast; or

iii) make the forecast based on the previously-selected model;

train, by the processor, a plurality of machine learning models on a first portion of a data set;

validate, by the processor, a machine learning model on a second portion of the data set; and

retrain, by the processor, the machine learning model on a sum of the first portion and the second portion of the data set, the data set comprising a sum total of the processed historical product data and the processed historical location data;

receive, by the processor, a subsequent forecast request;

check if it is the first time a forecasting request for a particular product and location has been made and, if it is not the first time a forecasting request for the particular product and location has been made, then:

determine, by the processor, if a new class of relevant signal data has been added to the data set since a previous forecast request, and if a new class of relevant

signal data has not been added to the data set since a previous forecast request, then:

determine, by the processor, if an amount of new relevant signal data beyond a first threshold has been added to the data set since the previous forecast request, and if no amount of new relevant signal data beyond a first threshold has been added to the data set since the previous forecast request, then:

determine, by the processor, if there is a degradation of the machine learning model performance, and if there is a degradation of the machine learning model performance then:

engage, by the processor, in a machine learning model selection process when:

i) the data set has been updated by the new class of relevant signal data;

ii) the data set has been updated by the new relevant signal data beyond the first threshold; or

iii) the machine learning model has degraded;

or if there is no degradation of the machine learning model performance then:

determine whether a time interval between the first forecast request and the second forecast request is greater than a second threshold, and if the time interval between the

first forecast request and the second forecast request is greater than a second threshold then:

retrain, by the processor, a previously-selected machine learning model, or if the time interval between the first forecast request and the second forecast request is not greater than a second threshold then:

instruct the forecasting module to forecast using the machine learning model.

The Law – Section 1(2)

- 7 The section of the Act concerning inventions excluded from patentability is section 1(2). This reads:

“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 –

...

(c) a scheme, rule or method for performing a mental act, playing a game or doing business or a program for a computer;

...

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.”

8 In order to decide whether an invention relates to subject matter excluded by Section 1(2), the Court of Appeal has said that the issue must be decided by answering the question of whether the invention reveals a technical contribution to the state of the art. The Court of Appeal in *Aerotel/Macrossan*¹ set out the following four-step approach to help decide the issue:

- 1) Properly construe the claim;
- 2) Identify the actual (or alleged) contribution;
- 3) Ask whether it falls solely within the excluded subject matter;
- 4) Check whether the actual or alleged contribution is actually technical in nature.

9 The case law on computer implemented inventions has been further elaborated in *AT&T/CVON*² which provided five helpful signposts to apply when considering whether a computer program makes a relevant technical contribution. In *HTC v Apple*³, Lewison LJ reconsidered the fourth of these signposts and felt that it had been expressed too restrictively. The revised signposts are:

- i) whether the claimed technical effect has a technical effect on a process which is carried on outside the computer;*
- ii) whether the claimed technical effect operates at the level of the architecture of the computer; that is to say whether the effect is produced irrespective of the data being processed or the applications being run;*
- iii) whether the claimed technical effect results in the computer being made to operate in a new way;*
- iv) whether the program make the computer a better computer in the sense of running more efficiently and effectively as a computer; and*
- v) whether the perceived problem is overcome by the claimed invention as opposed to merely being circumvented.*

Application of the Aerotel Test

Step 1 - Properly construe the claim

10 The only components of claim 1 which must be implemented in hardware are the processor, the memory and the storage device. There is nothing in the application to suggest these are anything other than standard components of a computer system, operating in the usual way. I understand, in the light of paragraph 140 of the

¹ *Aerotel Ltd v Telco Holdings Ltd (and others) and Macrossan's Application* [2006] EWCA Civ 1371

² *AT&T Knowledge Ventures and Cvon Innovations Ltd v Comptroller General of Patents* [2009] EWHC 343 (Pat)

³ *HTC v Apple* [2013] EWCA Civ 451

description, that the various modules referred to in the description may be implemented as executable software code.

- 11 The term “historical product data”, in claim 1, clearly corresponds to the client data of the description. Similarly, it is clear the “historical location data” does not relate to positioning information but rather corresponds to the external data of the description.
- 12 The first few lines of claim 1 appear to suggest that the historical data relates to “a product” (singular) and the historical location data to “the location” (singular). However, later in the claim, reference is made to determining, for a “subsequent forecast request” whether it is “the first time a forecasting request for a particular product and location has been made”. This would seem to point towards the historical data relating to a plurality of products and a plurality of locations, as is suggested in paragraphs 52 and 55 of the description.
- 13 The client data is discussed in paragraph 52, and I understand from this that the historical product data must at least include sales records for at least one of the client’s products at one or more locations. In practice, it would likely relate to sales of multiple products at multiple locations. In the light of paragraph 55 of the description I construe “historical location data” as non-product data associated with each of the locations for which product data is provided. The description suggests such data could be in the form of weather data and information on local holidays at each of a plurality of different locations. It follows that the forecast request (of line 13 of claim 1) must be for one of the one or more products at one of the one or more locations.
- 14 The feature engineer step of the claim refers to a pre-processing step involving transforming input data into forms more suited for ML. Examples of this are provided in Figure 4 of the application, for example. I understand that, in the field of machine learning, it is standard practice to perform such feature engineering on data sets.
- 15 I construe claim 1 to require that the system has the capability to perform each one of the forecasting method options i-iii, listed at lines 28-31 of the claim, and must select one of these forecasting method options. This much is clear from Figure 10. The forecasting is carried out using either a new ML model (option i) or a previously-selected ML model (options ii or iii). It is implicit that option iii is performed without retraining, otherwise it would be duplicate option ii.
- 16 When claim 1 is construed in the light of the description and figure 10, it becomes obvious that the last 30 lines of claim 1 define how the forecasting method option is selected. The term “data set” is not clearly defined in claim 1, but I will construe “data set” as features or data derived from input product and non-product data which are relevant to a current forecast request.
- 17 If any one of conditions i-iii of lines 56-60 of the claim are met, then forecasting method option i must be selected. Option selection based on these conditions corresponds to steps 1008, 1010 and 1012 of Figure 10. When lines 40-42 of claim 1 are construed in the light of step 1004, it seems implicit that option i must also be selected in the event a forecast request is the first request for a particular product-location combination; these lines provide a fourth condition for triggering selection of option i. In condition i, I understand “new class of relevant signal data” to mean a new type of input product or non-product data. For example, the description explains

that adding humidity information to existing weather data would provide a new class of signal data.

- 18 If none of the four conditions referred to above trigger selection of option i then a previously selected ML model may be used. The final 8 lines of claim 1 set out that forecasting method option ii is necessary if the time interval between a current forecast request and a previous forecast request is greater than a threshold time interval (step 1014/1016), but if the time interval is less than or equal to the threshold then option iii is sufficient (step 1014/1018). Here, I have assumed “the machine learning model” of the final line of the claim was intended to refer to the “previously-selected” ML model.
- 19 I will now return to lines 32-38 of the claim. The claim does not make clear the synergy between this part of the claim and the rest of the claim. However, having viewed those lines in the light of Figure 11 and paragraphs 108-116 of the description, it seems to me that the train and validate steps of lines 32-35 of the claim define how the ML model is selected in forecasting method option i, whereas lines 36-38 provide more detail of forecasting method option ii. Line 32 of the claim refers to training a plurality of ML models, but line 34 of the claim refers to validation of “a machine learning model”. However, paragraph 112 states: *“each trained ML model then provides a prediction for the time period corresponding to the validation portion...and the most accurate model is selected for further processing...”*. It is obvious to me that each ML model which has been trained must also be validated, particularly as a ML model cannot be used to make a forecast unless it has first been validated, and so there would be no point in training a ML model without validation. I therefore construe the validation step as *“validate, using a second portion of the data set, each of the machine learning modes which have been trained”*.
- 20 Although not explicitly stated in claim 1, it is implicit that, upon receiving a request for a forecast, the forecast is produced by applying a suitable ML model (as determined by the selection of one of options i-iii) to data or features derived from a subset of the input product or non-product data which is relevant to the request.
- 21 Finally, I note that it is essential to the invention that the forecasting is of sales of a product. No other examples of forecasting are provided in the description. I therefore construe claim 1 as being limited to forecasting sales of a product.

Step 2 - Identify the contribution

- 22 The next step of the Aerotel test is to identify the contribution. The most recent attorney’s letter (dated 4 November 2022) does not set out the contribution made by the invention as currently claimed. However, the attorney’s letter date 18 November 2021 indicates that the applicant considered the contribution to be:

an improved system to optimise the operation of the supply chain.

- 23 The examiner, however, has provided a more detailed assessment of the contribution as:

A computer program for generating sales forecasts for a product at a location by generating a first sales forecast based on processed historical product and location data using one of three forecasting methods:

- *selecting and using a machine learning model; or*
- *retraining and then using a previously-selected machine learning model; or*
- *using a previously-selected machine learning model;*

and, when generating a second sales forecast for the same product at the same location, if no new class of relevant data has become available and a threshold amount of new relevant data hasn't become available, generating the second sales forecast using one of three forecasting methods:

- *if the performance of the machine learning model used for the first sales forecast has degraded, then selecting and using a new machine learning model; or*
- *if the performance of the machine learning model used for the first sales forecast hasn't degraded and a threshold time has elapsed since generating the first sales forecast, then retraining and using the machine learning model used for the first sales forecast; or*
- *if the performance of the machine learning model used for the first sales forecast hasn't degraded and a threshold time has not elapsed since generating the first sales forecast, then using the same machine learning model as used for the first sales forecast.*

24 In the examiner's view, training, validating and retraining are ubiquitous in the field of machine learning, and so this sequence of steps does not appear in their contribution. I agree it is well known to apply training and validation to a single ML model, however I have not been presented with any evidence to show it is known to apply training and validation steps to a plurality of candidate ML models. I shall therefore include this step in my contribution. However, I agree with the examiner that feature engineering is standard practice in the art and need not appear in the contribution.

25 Given these points, and my above construction of claim 1, I identify the contribution to be:

A computer program which

receives inputs including product data for one or more products at one or more locations, non-product data associated with each of the one or more

locations and a request for a sales forecast for one of the products at one of the locations;

selects a new machine learning (ML) model from a plurality of candidate ML models (after applying training and validation to each of the candidate ML models) if at least one of a plurality of predetermined conditions apply but selects a prior ML model if none of the conditions apply; and

generates a sales forecast by applying the selected ML model to a data set derived from a subset of the product and non-product data relevant to the forecast request;

wherein if a prior ML model is selected it must be retrained before use if the time interval between a current forecast request and a most recent prior forecast request (to be fulfilled using the selected prior ML model) exceeds a threshold time.

Step 3 – Ask whether the contribution falls solely within excluded subject matter

i. Method of doing business

26 In their pre-hearing report of 10 January 2023, the examiner argued that the invention lay in forecasting product sales and maintained that such forecasting is “*an administrative, commercial, financial, managerial and organisational business planning task, and so falls squarely and solely within the excluded subject matter as a scheme, rule, or method of doing business as such.*”

27 Naturally, the applicant disagrees. The attorney’s letter dated 4 November 2022 states:

“We maintain that the claimed invention has a specific technical purpose that solves a real-world problem involving the operation of a supply chain for the purpose of facilitating movement of items between locations. The specific technical purpose is achieved with the selection and training of a machine learning model, as recited in claim 1.”

28 In *Halliburton*⁴, Birss J considered the question of whether a system, implemented in computer software, which performed a task with “real world consequences” could escape the Section 1(2) exclusions. At paragraph 33, he stated:

*If the task the system performs itself falls within the excluded matter and there is no more to it, then the invention is not patentable (see *Symbian* para.53 above). Clear examples are from the cases involving computers programmed to operate a method of doing business, such as a securities trading system or a method of setting up a company (*Merrill Lynch and Macrossan*). Inventions of that kind are held not to be patentable but it is important to see why. They are more than just a computer program as such. For example, they self evidently perform a task which has real world consequences. As Fox L.J. said*

⁴ *Halliburton v Comptroller General* [2012], RPC 12, at [33]

in Merrill Lynch (p.569 at line 27), a data processing system operating to produce a novel technical result would normally be patentable. However that is not the end of the analysis. He continued: "however it cannot be patentable if the result itself is a prohibited item" (i.e. a method of doing business). When the result or task is itself a prohibited item, the application fails.

29 It is clear from this that the mere presence of a real-world consequence is not enough to overcome the business method exclusion. If the task carried out by the invention, or the result produced, is a business method then the application fails to satisfy the requirements of section 1(2). I am confident that that is the situation here. The system of claim 1 generates a sales forecast, which clearly relates to a method of doing business. The invention of claim 1 does not relate to the movement of items between locations, never mind movement of items in a manner which produces a technical effect. Even if the invention of claim 1 could be considered to relate to solving a real-world problem, the problem solved is a business problem, not a technical problem.

30 For completeness, I note that the examiner's pre-hearing report also stated that "*mere use of 'real-world' data in a non-technical business method is not enough to avoid the exclusion*". The Examiner drew on the EPO *Guidelines for Examination*⁵ to support this position:

The mere fact that the input to a business method is real-world data is not sufficient for the business method to contribute to the technical character of the claimed subject-matter, even if the data relate to physical parameters (e.g. geographic distances between sales outlets) (T154/04, T1147/05, T 1029/06).

31 The examiner also argued that as amended claim 1 involves using historical data such as product sales forecast data to produce a sales forecast, it is analogous to the sales activity estimating system of EPO decision T 154/04⁶, a basis for the EPO guidelines referred to above. Here, I agree with the examiner's analysis, which is consistent with the conclusion I reached by applying Birss J's guidance in Halliburton.

32 The second argument put forward in the attorney's letter dated 4 November 2022 reads:

The specific technical implementation of the machine learning system is further defined in attached amended claim 1 through the introduction of the monitoring module and the forecasting module. These additional modules further configure the system to select or retrain a machine learning model prior to the machine learning module being used to make a forecast. The technical operation of the claimed system is changed due to the combination of steps involving the interaction between the modules and the machine learning model because the steps performed by the system prior to the actual forecast by the machine learning model have changed.

⁵ Guidelines for Examination, at G.II.3.5.3

⁶ *Estimating sales activity / DUNS LICENSING ASSOCIATES*, T0154/04

- 33 As I have already observed, the monitoring module and the forecasting module are, in practice, software modules. As I understand it, the applicant's argument here is essentially that the claimed method of selecting or retraining a ML model is novel and should be regarded as performing a technical operation. In short, the invention provides a better forecasting model.
- 34 Similarly, in the attorneys' letters of 18 November 2021 and 28 February 2022 the applicant argues that training, validating and selectively retraining a ML model provides an improved computing system. It is not entirely clear whether the argument here is i) again that the invention provides a better forecasting model, or ii) that the invention provides a better computer, in the sense of the third AT&T signpost. I shall deal with the first possibility in the next paragraph and return to the second possibility when I consider the signposts, below.
- 35 In Merrill Lynch⁷, Fox LJ explained

The fact that the method of doing business may be an improvement on previous methods of doing business does not seem to me to be material. The prohibition in section 1(2)(c) is generic; qualitative considerations do not enter into the matter. The section draws no distinction between the method by which the mode of doing business is achieved. If what is produced in the end is itself an item excluded from patentability by section 1(2), the matter can go no further.

- 36 Therefore, even if I were to accept that the forecasting model claimed was better than previous forecasting models, it would nevertheless still be a method of doing business and therefore excluded under Section 1(2).
- 37 Furthermore, even if I had used the applicant's formulation of the contribution made by the invention, rather than my own, this would not alter my conclusion that the invention relates solely to a method of doing business.

ii. Program for a computer

- 38 The Examiner also considers the invention to be excluded as a program for a computer as such. As I have already decided that the invention is excluded as a business method, there is no need for me to consider this matter. However, for completeness I shall do so.
- 39 Clearly, the invention is enacted by software running on a computer. However, the relevant question is whether the identified contribution is solely a program for a computer, as such. It is useful here to consider the five AT&T signposts, though I note that the applicant has not explicitly referred to them.
- 40 The first AT&T signpost asks whether there is a technical effect on a process which is carried on outside the computer. The processes carried out by the invention are carried out entirely within a computer system. As discussed above, the invention may receive real-world data, and output real-world data which is useful for managing

⁷ Merrill Lynch's Application [1989] RPC 61 (EWCA), at 569

a supply chain in the real-world, but there is no physical movement of goods, or other technical effect outside of the computer. Thus, the first signpost is not met.

- 41 The invention is clearly a software application which processes only data of a particular type (product data and its location-paired non-product data). The invention, then, does not apply irrespective of the data being processed and it does not operate at the level of the architecture of the computer. Therefore, the invention does not satisfy the second signpost.
- 42 The third signpost asks whether there is a technical effect which results in the computer being made to operate in a new way. As discussed above, it is the applicant's view that training, validating and selectively retraining a ML model provides an improved computing system. As I understand it, training, validating and retraining are common features of machine learning models. However, in the absence of any evidence to the contrary, it seems plausible that retraining selectively (based on whether certain conditions are met) could result in a better forecasting model or computer program. Similarly, the attorney's letter dated 28 February 2022 argues that because the invention allows multiple ML models to be used more effectively than in the past, the technical operation of the system is changed. Again, it seems plausible, at least to me, that selecting between candidate ML models could result in a better forecasting model/computer program. But producing a better computer program is not enough to meet the third signpost, there must be a better computer. The invention of claim 1 does not solve any problem within the computer itself. There is no technical effect beyond the mere running of a better program. Thus, the third signpost is not met. Similarly, there is nothing in the application to suggest that the program makes the computer a better computer in the sense of running more efficiently and effectively, and so the fourth signpost is also not met.
- 43 Turning now to the final signpost, the problem being overcome is one of generating sales forecasts from product data and other data. As discussed above, this is a business problem, not a technical problem. The fifth signpost therefore cannot apply.
- 44 As none of the signposts demonstrate a technical effect, and I can see no technical effect outside of the signposts, I conclude that contribution made by the invention is a program for a computer as such.

Step 4 – Ask whether the contribution is actually technical

- 45 The final step of the *Aerotel*¹⁷ test is to check whether the contribution is technical in nature. Since I have decided that it does not have a technical effect beyond that of programs running on computers, it also fails this step of the test. I thus decide that the invention is excluded under section 1(2).
- 46 I will also comment that while the use of multiple machine learning models may look quite 'technical' at first glance, there is no detail of how these models work. I must therefore assume that they are known machine learning models. As the steps of training and validating such models are also well known, the step of choosing a particular known model based on business criteria is not enough in itself to generate a non-excluded technical contribution.

- 47 I am reassured that this assessment agrees with the “Examining artificial intelligence guidelines” published⁸ by the IPO in 2022, specifically scenario 7.

Decision

- 48 I have decided that the invention defined in the claim falls solely within matter excluded under Section 1(2) as a method for doing business and a program for a computer as such. Having reviewed the application, I do not consider that any saving amendment is possible. I therefore refuse this application under Section 18(3).

Appeal

- 49 Any appeal must be lodged within 28 days after the date of this decision.

Dr Stephen Brown

Deputy Director, acting for the Comptroller

⁸ <https://www.gov.uk/government/publications/examining-patent-applications-relating-to-artificial-intelligence-ai-inventions>