Al and Patents: Key Considerations (South Korea)

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A Practice Note discussing key issues concerning patents and AI inventions, including machine learning, neural networks, and deep learning technology, and their applications. This Note discusses recent AI patenting trends, potential types of AI-related inventions, and key issues for obtaining patent protection for AI-related inventions in South Korea. It also discusses AI inventorship, patent specification requirements, novelty, and obviousness or inventive step for patents and applications claiming AI-related technology.

Al and Patents in South Korea Subject Matter Eligibility Patent Disclosure Requirements Level of Skill in the Art Written Description Enablement Claim Clarity Inventorship Novelty and Inventive Step Other IP Protection for Al Inventions Copyright Act Unfair Competition and Trade Secrets Industrial Technology Protection Act

Al innovation, including techniques for computation, speech and image recognition, predictive analysis, and their applications in different fields, has become increasingly common and consequential across many technologies. Through vast amounts of data and complex computer algorithms, computers are now able to better recognize objects and make predictions and play an important role in robotics, automated transportation, natural language processing, telecommunication routing, and other areas. For example, Al-related inventions provide tools that promise to improve the efficiency and effectiveness of medical research, and, ultimately, diagnoses and treatments.

Despite the critical importance of AI-related inventions to these and other technological advances, current South Korean patent law is still developing, including in areas addressing the patentability of AI-related inventions. This uncertainty risks incentivizing potential patentees to keep certain techniques of important AI-related inventions secret rather than seek patent protection, reducing the open exchange of information that is fundamental to the South Korean patent system.

This Note discusses key issues regarding patents and AI-related technology, including:

- Recent AI patenting trends in South Korea.
- Patent-eligible subject matter.
- Written description, enablement, and claim clarity.
- Al inventorship.
- Novelty and inventive step.

Al and Patents in South Korea

In South Korea, the concept of "The Fourth Industrial Revolution," first proposed by Klaus Schwab, the chairman of the World Economic Forum in 2016, is more widely accepted across various sectors of its society as compared to other countries. For example, the government established the Presidential Committee on the Fourth Industrial Revolution (PCFIR), which serves as a control center for the Fourth Industrial Revolution (4IR) sector, directly under the President. The PCFIR appoints the Prime Minister and private sector experts as its co-chairs.

On 25 October 2019, the PCFIR announced recommendations to the government for the 4IR era, including the recommendation to establish a safe and free utilization basis of AI and data. In line with this approach, the South Korean government, particularly the Ministry of Science and ICT and the Korean Intellectual Property Office (KIPO), plays a leading role in discussions on government policies related to AI.

In particular, the KIPO classifies technologies related to the following fields as key technologies of the 4IR era:

- Al.
- Big data.
- Internet of Things (IoT).
- Digital healthcare.
- Bio-markers.

- Intelligent robots.
- Autonomous driving.
- 3D printing.

Patent applications in these fields have increased from approximately 7,057 in 2013 to around 24,341 in 2022, and this upward trend is continuing (see KIPO: Al-related patent applications).

In particular, in the field of AI, patent applications have increased dramatically from around 444 in 2013 to approximately 8,960 in 2022, representing about a 20-fold increase. This explosive growth, averaging around 39.6% annually, has positioned the AI field as having the highest number of patent applications filed among these key 4IR technologies. (See KIPO: AI-related patent applications.)

Notably, certain 4IR technologies fields (such as big data, IoT, digital healthcare, intelligent robotics, and autonomous driving) have significant associations with AI-related technologies. Therefore, it is challenging to accurately grasp the trend of patent applications related to AI by focusing solely on the pure "AI" category in the KIPO's classification. The KIPO also observes trends in areas where AI technology is combined with other related fields. Overall, there has been an average annual increase of around 40% in patent applications in these combined areas, suggesting that patent applications related to AI and its integration with other fields have increased approximately 40 times over the decade from 2012 to 2021. (See KIPO: Trends in AI and Advanced Technology Patent Applications.)

The KIPO does not disclose specific allowance rates for the 4IR-related technology fields or their subfields. Instead, it divides the allowance rates based on the World Intellectual Property Organization (WIPO) technology classification into five main categories. The following are these five categories, along with the approximate allowance rate for each category as of 2022, which may serve as reference points for the AI-related technologies:

- Electrical engineering: 76% (83% including reexamination).
- Instruments: 76.5% (82.5% including reexamination).
- Chemistry: 69.6% (77.7% including reexamination).
- Mechanical engineering: 74.6% (79.1% including reexamination).
- Other fields: 70.1% (74.2% including reexamination).

(See KIPO: 2022 Intellectual Property Statistics Yearbook.)

Subject Matter Eligibility

According to Article 33(1) of the Korean Patent Act (KPA), any person who makes a new invention or their successor is entitled to obtain a patent. Additionally, an invention is defined in the KPA as a "highly advanced creation of a technical idea

utilizing the laws of nature" (Article 2(1), KPA). Therefore, AI-related inventions must meet this requirement to be recognized as eligible for patent protection.

For more information on patent-eligible subject matter in Korea generally, see Practice Note, Patent-Eligible Subject Matter (South Korea).

For a chart showing a basic overview of AI-related inventions, see KIPO: Examination Practice Guide by Technology Field (August 2023) (Examination Practice Guide), at 1101.

According to the overview provided by the KIPO, the following areas can be the subject of a patent for an AI-related invention:

- Definition of a learning model.
- Physical implementation.
- Completed learning model.
- The data preprocessing area, depending on the specific content.

Accordingly, for example, in AI-related inventions where information processing by software is concretely realized using hardware, the following may be considered as patent-eligible inventions:

- The software itself.
- Machines operating in cooperation with the software.
- Methods of operation thereof.
- Computer-readable media recording the program.
- Computer programs stored on such media.

However, the computer program itself is merely instructions for operating a computer and may not be recognized as patenteligible subject matter.

These AI-related inventions are based on information processing by software and implemented using computers. Therefore, the criteria for determining the patent eligibility of these AI-related inventions are generally the same as those for determining the patent eligibility of inventions related to computers and software. The KIPO provides detailed guidance on this through periodic updates to their examination guidelines.

Since announcing its examination guidelines for AI-related inventions in 2020, the KIPO has been providing detailed guidance on patent eligibility of AI-related inventions through periodic updates (see KIPO: Patent Examination Guidelines).

For the English translation of an abbreviated version of the Examination Practice Guide, see the KIPO's Examination Guide in the AI Field.

The KIPO provides the following guidance regarding whether AI-related inventions meet the following two subject matter eligibility requirements under Article 2(1)-(2) of the KPA:

- Utilization of natural laws. An invention eligible for patent protection must utilize natural laws. An invention is not eligible for patent protection if it:
 - · relies on laws other than natural laws, artificial decisions, or human mental activities; or
 - is merely a presentation of simple information.

The determination of whether natural laws are utilized is assessed based on the entire scope of the claims. Even if some parts of the claims utilize natural laws, if the invention as a whole is deemed not to utilize natural laws, it may not be considered patentable. (Examination Practice Guide, at 1301-02.)

• Creation of technical ideas. An invention eligible for patent protection must correspond to the creation of technical ideas. For instance, performing specific control of a device or necessary processing for control, or performing information processing based on the technical nature of the subject, qualifies as such. (Examination Practice Guide, at 1302.)

If it is unclear whether an AI-related invention constitutes the creation of technical ideas utilizing natural laws, the determination is based on whether the invention corresponds to the concrete realization of information processing by software using hardware. This means that the software and hardware cooperate to achieve a specific purpose through operations or processing characteristic of the purpose, realized through specific means or steps.

However, in the case of AI-related inventions, it is crucial to consider whether the software and hardware cooperate to achieve specific operations or processing of unique information without the intervention of human mental activities to obtain the same effect repeatedly. Therefore, determining whether the claims include specific means or methods for achieving information processing specific to the purpose, in cooperation with software and hardware, is crucial in determining patent eligibility.

Patent Disclosure Requirements

Pursuant to the KPA:

- The description of the invention must be clear and detailed enough for a person skilled in the relevant technical field to easily carry out the invention based on common knowledge in the field at the time of filing (Article 42(3)(1), KPA).
- The description of the invention must include the technology underlying the invention (Article 42(3)(2), KPA).
- The claims must be supported by the description of the invention (Article 42(4)(1), KPA).
- The invention should be clearly and concisely stated in the claims (Article 42(4)(2), KPA).

There is no best mode or method requirement under Korean patent law.

In the patent practice of South Korea, the following points concerning AI-related inventions are particularly contentious:

- Whether the claims are supported by the description of the invention (see Written Description).
- Whether the description of the invention enables easy implementation of the invention (see Enablement).
- Whether the invention is clearly and concisely stated in the claims (see Claim Clarity).

Level of Skill in the Art

In the field of AI technology, a person skilled in the art is an imaginary figure under patent law who:

- Possesses "common technical knowledge" in the field of AI.
- · Has access to everything related to the state of the art relevant to the task of the claimed invention.
- Is capable of using standard methods for research or development, including experiments, analysis, and manufacturing.
- Is capable of exercising ordinary creativity, including making design changes.

The description of an AI-related invention should be stated clearly and in detail for a person skilled in the art to easily implement the invention based on the common technical knowledge at the time of the filing (see Written Description and Enablement).

Written Description

Whether the claims are supported by the description of the invention is judged based on the level of skill in the art at the time of filing the patent application. The matters specified in the claims must correspond to those disclosed in the description of the invention from the perspective of a person skilled in the art. If the claims are not supported by the description of the invention, the relevant part may be considered invalid (Article 133(1)(1), KPA).

The KIPO provides the following specific examples of an inadequate description:

- Matters corresponding to those specified in the claims are not explicitly or implicitly disclosed in the description of the invention.
- Matters specified in the claims as means or steps for performing certain functions are not specifically disclosed in the description of the invention.

• When it is difficult to expand or generalize the contents disclosed in the description of the invention to the claims, considering the common knowledge in the relevant technical field at the time of filing.

(Examination Practice Guide, at 1205.)

Enablement

The description of the invention in the specification must be written clearly and in detail so that a person skilled in the art can easily practice the claimed invention (Article 42(3)(i), KPA). This requirement ensures that the content of the claimed invention is disclosed in a way that allows a third party to easily understand it from the specification alone, thereby clarifying the technical details and scope of the claimed invention that is to be protected by the patent.

The level of detail required in the specification means that a person skilled in the art should be able to accurately understand and reproduce the claimed invention based on the description, without conducting undue experimentation or possessing special knowledge beyond the ordinary level of skill in the art at the time of filing (see, for example, Supreme Court Decision 2003Hu2072, dated 24 November 2006).

To ensure that an invention can be easily implemented based on its description, the following should be clearly stated:

- Specific means for reproducing the invention. For AI-related inventions, this could include:
 - training data;
 - data preprocessing methods;
 - training models; or
 - loss functions.
- Technical challenges addressed by the invention.
- Solutions to these technical challenges.

(Examination Practice Guide, at 1201; Section 2.1.1, Examination Guide in the AI Field.)

Patents that do not meet the enablement requirement under the KPA due to the absence of specific means for reproducing the invention constitute an independent ground for patent invalidation under Article 133(1)(1) of the KPA.

However, simply because certain specific means for reproducing the claimed invention are not included in the description does not necessarily mean there is a violation of the enablement requirement. If, considering the common knowledge at the time of filing, the means for reproducing the invention can be clearly understood by a person skilled in the art based on the description, even without explicit mention of certain specific means, the description may meet the enablement requirement.

For example, if the technical challenge addressed by the claimed invention can be solved and its effects can be confirmed using commonly known machine learning methods, even if the training model or method to be trained using the training data is not explicitly stated but only the commonly known machine learning method is mentioned, this may be sufficient to meet the enablement requirement.

The KIPO provides the following examples of specific violations of the enablement requirement:

- The technical steps or functions corresponding to the claimed invention are only abstractly described without specifying how those steps or functions are executed or realized by hardware or software.
- The correlation between input data and output data of the trained model, as a specific means for implementing the claimed invention, is not specified. Instead, there must be a "specifically described correlation," which means:
 - the training data is specified;
 - there is a correlation between the characteristics of the training data and solving the technical challenge of the invention;
 - the trained model or training method using the data is specifically described; and
 - a trained model for solving the technical challenge of the invention is actually generated based on the above descriptions.
- The data preprocessing process, which is a characteristic technical aspect of the claimed invention for converting collected raw data into training data, is not described in detail regarding how the raw data is converted into training data or the correlation between raw data and training data is not specified.
- Only diagrams or flowcharts are provided for the hardware or software that implements the functions of the claimed invention, making it difficult to clearly understand how the hardware or software is actually implemented.

(Examination Practice Guide, at 1201-04; Section 2.1.2, Examination Guide in the AI Field.)

Claim Clarity

For the scope of the claims to be clearly defined and not render the claimed invention ambiguous, specific terminology that can be easily understood by a person skilled in the art must be used. The use of terms that obscure the composition of the invention or differ in meaning from those defined in the description of the invention is not permitted, and such unclear claims may constitute grounds for patent invalidation (Article 133(1)(1), KPA).

However, if the meaning is partially unclear but can be easily understood and replicated by a person skilled in the art, it may not be considered a violation of the patent disclosure requirements.

The KIPO provides the following specific examples of violations of claim clarity:

- The claims do not clearly define the performer of the invention (hardware).
- The subject of the claimed invention is not clear. For example, if the claim scope is "a program product," it may be unclear whether the "output" refers to the medium on which the program is recorded or the computer system with which the program is combined.
- The category of the claimed invention is not clear. Under Korean patent law, patents can be classified as inventions of products, methods, or methods of producing products (Article 2(3), KPA). For example, if the claim scope is "a program signal," it may be unclear whether this is an invention of a product or a method, violating the claim clarity requirement.
- The invention is not clearly defined. For example, if the claim scope is "a device comprising an input layer and an output layer," terms like "input layer" and "output layer" may not be suitable as components of the device or may be difficult to specify.

(Examination Practice Guide, at 1209-10.)

Additionally, the KIPO provides examples of appropriate claim formats for AI-related inventions, such as claims related to:

- Computer program recording media used for installing, executing, or distributing computer programs.
- · Computer programs recorded on (hardware-integrated) recording media.
- Data structure recording media with a structure defining processing content performed by a computer.
- Computer programs implementing stored learning models.
- Articles or devices (utilizing learning models).

(Examination Practice Guide, at 1206-09; Section 2.2.2, Examination Guide in the AI Field.)

While the claim format for AI-related inventions is not limited to these types, structuring claims according to the KIPO's classification may help satisfy the requirement of claim clarity.

Inventorship

Article 33(1) of the KPA specifies that the person who makes an invention, or their successor, holds the right to obtain a patent. Here, "person" refers exclusively to a natural person, while "successor" refers to both natural persons and legal entities. Therefore, a natural person (such as an employee) can create an invention in the course of their duties, and the company (a legal entity) can succeed to that invention.

The Patent Court in Case No. 2002Heo4811 also affirmed that "since an invention is a factual act, the term 'inventor' under the KPA refers to a natural person," thus excluding legal entities from being recognized as inventors.

If an AI-related invention is invented by a human, the determination of who the inventor is depends on the extent to which each party contributed to the inventive concept, which is similar to the inventorship and ownership determination under existing Korean patent law.

Recently, in the so-called "DABUS patent case," the South Korean court explicitly stated that, according to the KPA, "inventor" solely refers to a natural person, and therefore, AI cannot be recognized as an inventor (Seoul High Court Judgment No. 2023nu52088, May 16, 2024). Consequently, AI cannot be listed as an inventor in AI-related inventions because:

- Article 33(1) of the KPA stipulates that "a person who makes an invention or his or her successor" has the right to obtain a patent for the invention. Therefore, the inventor under the KPA would inherently acquire the right to obtain a patent for the invention on completion of the invention, thus being naturally assumed to have legal capacity.
- The existing stance of the South Korean courts has been that the term "a person who has made an invention" refers exclusively to a natural person (Supreme Court Decision No. 2011 da 67705,67712, 27 December 2012). The DABUS case is considered a reaffirmation of this position by the South Korean court.

For a patented invention involving AI where a person uses AI to invent something, in general, that person could be considered the inventor because they used AI as a tool to make the invention. This is also the position taken by the KIPO (see KIPO: White Paper on AI and Intellectual Property (March 2022), at 50).

However, according to the South Korean courts, to be recognized as an inventor, one must have made a substantive contribution to the inventive concept (Supreme Court Decision No. 2011 da 67705,67712, 27 December 2012). Therefore, even if someone has completed the invention with the help of AI, if it is difficult to argue that the person who used AI has made a substantive contribution to the inventive concept, it is possible that the person should not be listed as the inventor of the invention.

In the DABUS case, the South Korean court concluded that there is no legal basis to attribute the rights and obligations related to an invention made by AI to the owner or user of the AI, and it is not in line with the current system of the KPA. This could be interpreted as a denial of patent eligibility for creations made by AI. The KIPO has not yet provided clear guidance on this matter. However, with the US Patent and Trademark Office recently releasing the Inventorship Guidance for AI-Assisted Inventions (13 February 2024), the KIPO is expected to prepare guidelines on determining inventorship for AI-assisted inventions.

Novelty and Inventive Step

The KPA states that an invention lacks novelty if it falls under any of the following categories:

- It was publicly disclosed domestically before the effective filing date of the patent application.
- It was publicly used domestically before the effective filing date of the patent application.
- It was published in any domestic or foreign publication before the effective filing date of the patent application.

• It became available to the public via telecommunications, such as the internet, before the effective filing date of the patent application.

(Article 29(1), KPA.)

Novelty is determined based on the effective filing date of the patent application, not when the invention was completed or disclosed. For instance, if an invention is presented at a conference in the morning and someone files a patent application for that invention in the afternoon on the same day, the invention is considered not novel.

Al-related inventions are evaluated for novelty and inventive step based on essentially the same criteria as for inventions related to computers and software. However, there are certain specific criteria that are more unique to the assessment of novelty and inventive step for Al-related inventions:

- Identity with cited inventions. Comparing the claimed invention with cited prior art involves considering the
 specific means (such as training data, data preprocessing methods, learning models, or loss functions) used to
 implement the claimed invention. Even if there are some differences, if the claimed invention and the cited prior art
 invention are deemed "substantially identical" by a technical expert, the novelty of the claimed invention may be
 denied.
- **Inventive step.** The inventive step of the claimed invention is assessed based on whether it is easier for a person skilled in the art to reach the claimed invention from the "closest cited [prior art]" considering the common technical field and technical challenges.

In the AI technology field, it is common to simply combine methods or means used in different fields or apply them to a specific field to achieve a certain goal. However, the mere combination or application of methods or means in a particular field without technical difficulty may not be recognized as inventive. If combining or applying technologies from various fields is within the scope of ordinary creativity of a person skilled in the art, and there are no technical difficulties (technical obstacles) in doing so, then inventive step is not recognized, unless there are exceptional circumstances (such as a remarkable technical effect).

• Effects of Al-related inventions. Effects such as "rapid processing," "handling of large-scale data," "reduction of errors," and "improvement in prediction accuracy" are considered inherent results of Al-related inventions. Therefore, these effects alone may not be sufficient to demonstrate inventiveness. Instead, the criteria for assessing inventive step is strictly applied in these situations.

These effects are not considered unforeseeable by a person skilled in the art in the AI field and should be taken into account when assessing the inventive step of the claimed invention.

- Simple addition of Al technology. Inventive step may not be recognized if the invention merely involves:
 - adding AI technology to existing technology;
 - systematizing tasks or business methods performed by humans using AI; or
 - simply adding general-purpose AI technology.

• **Specific application of AI technology.** If the specific application of AI technology results in a change in the outcome of the claimed invention, inventive step may be recognized. However, if the change is merely a simple design change or modification of the learning model, inventive step may not be recognized unless it leads to a significant difference in the outcome.

The KIPO has provided specific criteria for recognizing inventive step for AI-related inventions:

- With technical features implementing the AI-related invention.
- With characteristics in data preprocessing.
- With characteristics in learning models.
- With characteristics in utilization of learning results.
- Used in different industrial fields.
- With characteristics in training data.

(Section 3.2.3, Examination Guide in the AI Field.)

The specific criteria for recognizing novelty and inventive step for these categories of AI-related inventions takes into account the technical features and effects of the AI-related invention.

Other IP Protection for AI Inventions

In addition to patent law, the following law may be considered for the protection of AI-related inventions:

- Copyright law (see Copyright Act).
- Unfair competition and trade secrets (see Unfair Competition and Trade Secrets).
- Protection of industrial technology (see Industrial Technology Protection Act).

Copyright Act

The Copyright Act provides protection for:

Databases as works.

• Programs as computer program works.

Databases, in particular, can play a crucial role in AI-related inventions, with preprocessed datasets potentially falling under this category.

The advantages of the Copyright Act include longer protection periods for the protected datasets or programs. However, there are limitations, such as fair use, and for databases, significant investment in arrangement and composition is required. Additionally, for source code, there is a restriction that rights cannot be exercised unless it is significantly different from other programs.

Unfair Competition and Trade Secrets

The Unfair Competition Prevention and Trade Secret Protection Act (Unfair Competition Prevention Act) can be divided into protection for:

- Data (see Protection for Data).
- Al models (see Protection for Al Models).

Protection for Data

Article 2(1)(k) of the Unfair Competition Prevention Act:

- Defines data as information that is:
 - provided to specific individuals or a specific group electronically;
 - accumulated; and
 - managed in significant quantities.
- Prohibits acts such as:
 - unauthorized acquisition or use of data;
 - leakage of data; and
 - weakening of technical protection measures for data.

Therefore, if data related to AI-related inventions meets the requirements under Article 2(1)(k) of the Unfair Competition Prevention Act, strong responses such as prohibition claims, damages claims, and criminal complaints against unauthorized use can be pursued. However, it may be difficult to meet these protection requirements.

Another type of unfair competition act is an achievement-mimicking act. This is defined as the unfair use of another party's achievements, which required significant investment or effort, for one's own business activities to reap the benefit of the other party's economic interests (Article 2(1)(m), Unfair Competition Prevention Act). Therefore, if data corresponds to these achievements, prohibition claims and damages claims are possible. However, this provision is a general clause, and it may be difficult to prove that data corresponds to achievements.

A trade secret is information that has characteristics such as confidentiality, economic utility, and secrecy management (Article 2(2), Unfair Competition Prevention Act). If data meets these requirements, it can be protected as a trade secret.

South Korea has a recent trend of imposing strong criminal liabilities for trade secret infringement acts, so data protection based on trade secrets can be a powerful means compared to protection based on patent law. There are no limitations on the protection period if the requirements for trade secrets are met. However, there is a need to maintain the requirements for trade secrets continuously, and once disclosed to the public, exclusive rights cannot be claimed.

Protection for AI Models

Protection for AI models themselves can be through provisions such as Articles 2(1)(m) and 2(2) of the Unfair Competition Prevention Act, which address achievement-mimicking acts and trade secrets, respectively. The specific pros and cons of these protections as compared to patent law are similar to those described in the context of data protection (see Protection for Data).

Industrial Technology Protection Act

The Act on Prevention of Divulgence and Protection of Industrial Technology (Industrial Technology Protection Act) is a law aimed at preventing espionage acts related to industrial technology. Under Article 2(1) of the Industrial Technology Protection Act, even if advanced technologies do not meet the requirements of trade secrets, acts of infringing industrial technology may be subject to similar civil and criminal liabilities as those for infringement of trade secrets under the Unfair Competition Prevention Act.

Specifically, Article 2(1)(b) of the Industrial Technology Protection Act defines advanced technologies designated under the Industrial Development Act as one type of industrial technology. This category includes various AI-related application software technologies, such as:

- Machine learning technology.
- Knowledge representation and inference technology.
- Cognitive model technology.
- Search and automatic indexing technology.

- Other AI-related application software technologies, including:
 - speech recognition;
 - automatic language translation;
 - dialogue processing;
 - natural language question answering;
 - image processing;
 - image recognition;
 - video tracking; and
 - stereo conversion.

Therefore, if AI-related inventions fall into these classified technologies, the information and data related to those technologies may be included in the scope of protection under the Industrial Technology Protection Act.

The key advantage of protection under this act is that it can provide protection at a level similar to trade secrets (which is higher than that provided by patent law) without requiring the same stringent requirements as trade secrets. Additionally, unlike trade secrets, it does not require confidentiality, so it can provide overlapping protection with protection under patent law.

However, the abstract definition of the law makes it ambiguous whether the technology falls under the scope of protection under the Industrial Technology Protection Act. Additionally, like trade secrets, exclusive rights cannot be exercised against independently developed technologies that are substantially identical without infringement acts against the technology.