1. Introduction

The fourth industrial revolution is currently transforming economies, jobs, and even the society itself in ways that can truly change how we live, work and relate to one another. “Industry 4.0” refers to this jump in physical and digital technologies making companies more efficient, and transforming their decision making. Examples of these technologies include artificial intelligence (AI), the Industrial Internet of Things (IIoT), cloud computing, block chain and 3D printing among others.

Of course, Industry 4.0 is changing the Chinese market, and this is particularly visible in government plans to upgrade the manufacturing capacities of Chinese industry into a technology powerhouse. To that end, the Chinese authorities are focusing on developing sectors such as FinTech, e-commerce, e-healthcare and smart logistics. All these sectors could offer business opportunities for EU SMEs whose know-how and technology continues to be sought after.

Industry 4.0 technologies usually involve the development of hardware and software, but also rely largely on the development of data and information that are usually extremely easy to copy and disseminate on a large scale. Formulating a smart IP strategy adaptive to these changes is crucial to your success in the era of Industry 4.0.

It is sometimes difficult to apply the traditional concepts of IP to new technologies, so how can you protect and successfully exploit new technologies, business processes and creations, when doing business with China? This guide addresses the Intellectual Property issues often faced by SMEs engaged in Industry 4.0 walking you through how to safeguard your rights through registration and creation and implementation of contractual, cybersecurity and IP management best practices to secure both registered IP and trade secrets.

2. Copyright Protection

In accordance with Article 4 of the Copyright Law of the People’s Republic of China, copyright in China protects “works of literature, art, natural science, social science, engineering technology” and in particular, computer software. Note that copyright protects only the expression of an idea, not the idea itself. There are a number of new technologies which can be protected by copyright which we will explore below.

What can copyright protect in the industry 4.0 sector?

Software

One important use for copyright in industry 4.0 technologies is to protect software from being copied. However, you should be aware that copyright only protects the source code of the software. Remember, copyright protects the expression of ideas, not the ideas themselves so it does not protect against a third party developing a software with similar functions. As a result, if a third party changes the code by making some modifications, for example by using different code libraries or equivalent means, this would not be considered as copyright infringement. Patent protection could potentially be used to protect the functionality of a piece of software, however, software patents are allowed under special circumstances. See Section III for more information on software patents.

Algorithms

Algorithms are one of the most valued intangible creations in industry 4.0. Algorithms are closer to ideas, principles or methods, which are usually excluded from IP protection so they can be difficult to protect. Under copyright law, an algorithm, as a mathematical principle, belongs to the realm of ideas that are free to use and cannot be appropriated, while, under patent law, software is usually excluded from being patented with the exceptions that we will see in Section III.

However, in most cases, an algorithm is actually a creation integrated into the source code of software that can be protected under the copyright Law. As such an algorithm which is integrated into the source code of software can be protected by copyright.

Databases

Databases can be protected by the copyright law if they qualify as ‘compilation works’ in accordance with the Copyright Law. This means that such works should: 1) be a collection of data and 2) be arranged in a way that adds to the value of the data, such as through the selection or arrangement of the data, or the originality in the presentation of such data. In other words, there needs to be an element of originality in the compilation in order to receive some form
of protection as an original work. For example, compilation works such as a directory of recommended suppliers in a geographic region, a website containing texts and photos, a list of targeted customers, a file gathering public financial information from competitors etc. could be protected by copyright law if it can be shown that the author has made certain choices about the presentation of the work. You should, however, keep in mind that in case of disputes over potential infringements, it is the courts that make the final decision as to whether a particular database is original enough to qualify as a compilation work.

3D printing CAD files
3D printing CAD files contain the information required to 3D print a product. According to copyright law, “engineering design drawings” and “product design drawings” are in the scope of protection and as a result, 3D printing CAD files are eligible for copyright protection.

Who is the copyright owner and for how long is the copyright protected?
Copyright is owned by the creator of the work, or by the author’s employers if such work was created within an employment contract where the creative task is part of the job function.

In China, in case of commissioned works, unless otherwise stipulated in the contract, ownership belongs to the creator (and not the party which commissioned the work).

The rights to the copyright that allow owners to derive financial reward from the work, such as through performing, broadcasting or reproducing the work (known as economic rights) last for 50 years from the date of creation or publication, or in case the creator is an individual, 50 years from the death of the creator.

Registering Your Copyright in China
Similar to Europe, copyright in China arises automatically upon the creation of a copyrightable work. However, since Chinese courts and administrative authorities will require evidence of ownership in cases of infringement actions, it is generally advisable to voluntarily register copyright in China.

Registering through CPCC
You can register copyright in China with the Copyright Protection Center of China (CPCC). The procedure is inexpensive, easy and results in the granting of a copyright certificate. However, it is important to keep the evidence of creation and ownership (including drafts and drawings) as copyright registration only works as preliminary evidence of ownership, so you should have further evidence to support this in case a dispute arises.
3. Patent Protection

Registering copyright is also recommended if you want to license your rights or look for investors in your company. Potential investors and licensees in China are likely to ask for the copyright certificate before the deal.

**Registering using Block Chain Technologies**

In September 2018, the Supreme People’s Court of China confirmed that electronic evidence and in particular evidence obtained via block chain technology should be accepted by the Chinese courts, in particular in relation to copyright evidence.

How does this work in practice? It allows you to register your copyright online at any time and in any place, enabling a more efficient and faster registration process than the CPCC can provide. There are several online platforms, where you can register copyright using block chain technology, including for example the UniTrust Time Stamp Authority, used by several law firms in China. The registered information is recorded on the chain with a permanent timestamp, which is powerful evidence of your rights, so using block chain could offer an effective and inexpensive means of copyright registration.

**Are works generated by AI protectable by copyright?**

This question has been debated worldwide, and China is no exception. According to the Chinese Copyright Law, copyrightable works must be original and produced based on human intellectual activity, so works that are generated by a machine and not by a human do not strictly fall under the definition of copyrightable works. However, the law does also not state that works created by machines should not be protected by copyright, thus currently this decision is left for the courts to make.

In a recent case, a district court in Shenzhen ruled in favor of the company Tencent which claimed that an article generated by its Dreamwriter robot had been illegally copied by another company. The robot is an automated writing system based on the algorithms created by Tencent. Based on this decision, we can assume that in China, for now, works created by an AI can be protected by copyright. It should, however, be noted that Tencent was also the owner of the AI that produced the article and the courts could decide differently in cases where you are not the owner of the AI that creates original work. Regardless, this position, which will ultimately have to be confirmed in the future, shows how AI technologies are considerably increasing and putting pressure on the legislator and the courts to unify protection standards and provide clear guidance about the rights emerging from new technologies.

In China, there are three types of patents: invention patents, utility model patents and design patents. Patent protection should be considered to protect new technologies, and in particular hardware and software related inventions. It is important to assess your products to determine what elements could and should be patented. Where there is ambiguity over whether a certain element can be protected a lawyer familiar with Chinese patent law will be able to help you assess whether your invention is likely to be patentable, and how to draft your patent for the best protection.

**How to protect hardware inventions by patent?**

For hardware inventions, all three types of patent should be considered as each of them can protect the product in a different way.

**Invention patent**

According to the provisions of Article 2.2 of the Patent Law of the People’s Republic of China, the invention patent protects new technical solutions applied to a product, a process or their improvement. Invention patent has a maximum duration of 20 years from the filing date, subject to the payment of annuities.

**Utility model**

According to the provisions of the patent law, the utility model protects new technical solutions applied to the form, the structure of the product or a combination of both, and does not cover a process or method. It is usually used to protect minor improvements to existing technologies. A utility model is quicker and cheaper to obtain than an invention patent as there is no substantive examination, and can last up to 10 years from the filing date, subject to the payment of annuities.

**Design patent**

The function of the design patent is to protect the aesthetic features of a product. A design is defined as “the shape, pattern or the combination thereof, or the combination of the colour with shape and pattern, which are rich in an aesthetic appeal and are for an industrial application”. In short, the design patent can protect the distinctive exterior appearance of a product.

Moreover, since May 2014, the Patent Examination Guidelines provide that a graphical user interface can be protected by a design patent. This is useful in protecting website elements.
A design patent has a maximum duration of 10 years from the filing date, subject to the payment of annuities.

To obtain the design patent in China relating to a graphical user interface, you must present on the drawings the physical device (hardware) on which this graphic interface will be seen by users. Without this condition, the graphical interface is not patentable. You should pay attention to this, because this condition does not exist in other countries including the EU.

How to protect software inventions by patents?
Only invention patents can be used to patent software inventions. Patenting software inventions has only been possible since 2017.

Computer programs have long been excluded from patentable inventions under the law because they were not acceptable as the subject of a patent claim. This is because the terms of Article 25 of the Patent Law stipulate that an invention that merely relates to rules for mental activities is not patentable.

Since the new Patent Examination Guidelines issued in April 2017, if a claim is directed to a method or rules for mental activities, and includes a technical feature, the claim should not be excluded from patentability. In fact, the new Examination Guidelines make a clearer distinction between the concept of “computer program per se”, which is still not patentable, and an invention relating to the computer program. For example, regarding 3D printing, the new rules allowed a computer program including a 3D printing CAD file to be treated as a technical solution and as such, to be patented.

New Examination Guidelines related to inventions in Industry 4.0
On December 31st 2019, a new amendment to the Patent Examination Guidelines was announced. The new rules, which came into effect on February 1st 2020, cover inventions with features that include an algorithm or business rule/method. Such features are often found in claims of patent applications in the field of AI, application of internet in conventional industries, block chain and big data.

The new guidelines clarify that, in order to overcome the patentability exclusion as explained above, a claim must include technical features, and the claim as a whole must not be solely a rule and method of mental activity. The notion of technical feature is rather broad, it could be for example a database, a processor, a server, etc. Under such circumstances, the claim should be considered to relate to a technical solution in accordance with the patent law.

On the contrary, in the case of an abstract algorithm with no relation to a technical feature, the claim should be considered as pure mental activity and non-patentable under the patent law.

The guidelines also provide that, when examining the novelty of a claim containing technical feature and algorithmic feature, the examiner should examine the claim as a whole. When examining the inventive step of such a claim, the examiner should not separate the technical features and algorithmic features, but examine it as a whole considering whether both features functionally support each other or have a connection with each other. As a result, it is recommended to draft a patent description in a manner that shows how the technical features and algorithmic features support each other, interact with each other and produce beneficial effects. China IPR SME Helpdesk recommends to work closely with a local patent agent/lawyer to make sure that the patent description meets the criteria of patentability as explained in the new guidelines.

Can an AI system be recognized as an inventor?
Similar to copyright, there is considerable debate regarding whether an invention created by an AI system can be patentable. In late 2019, the European Patent Office refused two European patent applications that designated an artificial intelligence as the inventor. In China, this question has not been settled yet. This is likely due to the time gap between patent application filing and the patent examination procedure during which such questions can arise.

Patent and 3D printing
The number of patents involving 3D printing that are filed in China has significantly increased. However, 3D printing poses a significant risk of IPR infringement. Such technology allows fast and relatively inexpensive reproduction of any physical object that could be protected by a patent. Moreover, the digital environment makes 3D printing CAD files easy to upload, share and download.

In principle, if the design of a physical object is protected by a design patent, scanning this physical object and then printing it using a 3D printer should be a breach of a design patent. However, as further described in the Case Study no. 2, proving such infringement is challenging because in this situation, the “manufacturer” is typically the end user who simply downloaded the CAD file and created the object using a 3D printer. Under patent law, manufacturing of a patented product without the authorization of the right owner can constitute a direct patent infringement where it is done for production or business purposes, which is not the case where the manufacturer is an individual printing the object for their own personal use.
To protect Industry 4.0 new technologies, ideas and business processes for which patent and copyright protection might not be optimal, trade secret protection could offer a number of advantages.

**What is a trade secret?**
According to the Law Against Unfair Competition of the People's Republic of China (anti-unfair competition law), a trade secret is defined as technical information, operational information and other business information which is not public, has business value and has been protected by corresponding confidentiality measures. In a case of misappropriation and disclosure of trade secrets, the victim will be able to sue the infringer on the basis of the Anti-unfair Competition Law.

**What information can be protected by trade secrets?**
Trade secrets can protect a wide range of information, including source codes, algorithms (to the extent that they cannot be reverse engineered), as well as information that cannot be protected by other types of IP including operational information, such as processes and methods; or other information, such as marketing strategies, customer lists, materials, terms, and prices. Basically, trade secrets could protect any data you have as long as the 3 basic trade secret protection conditions are met: the information/data is not public, it has commercial value and appropriate measures have been taken to keep the information secret.

**What are the advantages of trade secret protection?**
Trade secrets offer a wide scope of protection if you are successful in preserving them. Firstly trade secret protection period is not limited in time while the protection of other types of IP has a maximum duration. In addition, the technology in question will not be reverse engineered, as well as information that cannot be protected by other types of IP including operational information, such as processes and methods; or other information, such as marketing strategies, customer lists, materials, terms, and prices. Basically, trade secrets could protect any data you have as long as the 3 basic trade secret protection conditions are met: the information/data is not public, it has commercial value and appropriate measures have been taken to keep the information secret.

**Enforcing Trade Secrets Effectively**
It is often said that trade secrets are more difficult to enforce than other types of IPR. Indeed, it is more difficult to obtain compensation on the basis of trade secret violation because you will have to prove that the protection conditions are fulfilled (3 basic conditions discussed above), while in contrast if the complaint is based on other types of IP such as copyright or patent, you will only have to provide the IP certificate to prove your right.

However, since the last amendment of the Anti-unfair Competition Law that came into effect on April 23th, 2019, the burden of proof in civil suits can be reversed when the plaintiff provides certain prima facie evidence. In practical terms, if you can bring some simple evidence that measures were taken to protect the confidentiality of your secrets, and can reasonably indicate that such secrets were misappropriated, then the burden of proof will be reversed, and the other party will have to demonstrate that that is not the case.

To prove misappropriation of information, it is enough if you can prove the possibility of the connection between your information and that of the other party, which could have happened by any means (for example, employee transfers, same suppliers or same clients, conference presence etc.). In practice though, it may be necessary to involve professional investigators to provide evidence of trade secret misappropriation. If the burden of proof is reversed, the other party must prove that the secrets were legitimately acquired, for example by showing that such secrets were disclosed in accordance with an agreement signed by both parties or proving that such secrets were publicly disclosed by their owner.

**Compensation for Trade Secret Misappropriation**
Damage shall be calculated based on the actual losses you suffer as a result of the infringement or where this is difficult to prove, the benefits obtained by the infringer. In changes to the Anti-unfair Competition Law punitive damages for repeating infringements have been raised from one to three times the loss of the right owner, profit made by the infringer or a reasonable license fee or royalties, to one to five times the same, while the upper limit of statutory damages has been raised to RMB 5 million [approx. EUR 651 570].

In general, IP experts concur that a good IP protection strategy often combines different means of protection, relying on copyright and patent protection for the aspects of new technologies that can be protected by these types of IP and using trade secrets where copyright and patent protection is not feasible or desirable. As every case is unique, it is recommended that you develop a comprehensive IP strategy with the help of an experienced IP professional.

The final section explores the confidentiality measures needed for trade secret protection and offers advice on how to protect valuable business information.
5. Contractual Protection and Preventive Confidentiality Measures

Confidentiality measures are necessary to trigger trade secret protection but they are also generally recommended to protect Industry 4.0 new technologies or business processes that already enjoy copyright or patent protection.

Best practices for maintaining confidentiality through Contracts

As theft of information mostly involves former employees or potential clients, it is important that you require employees to sign a non-disclosure agreement, including if necessary a non-compete obligation. You should also consider the possibility of splitting and limiting access to valuable information so that no employee is able to copy everything. These good practices should also include internal trainings as well as regular communications relating to confidentiality and applicable penalties, especially for employees leaving the company.

Regarding potential clients and suppliers, you should sign NNN agreements with Chinese counterparts before starting negotiations or sharing information. NNN agreements are non-use, non-disclosure and non-circumvention agreements that prohibit the sharing of confidential information shared between the contractual parties. They are a highly recommended prerequisite for most commercial negotiations, partnership and consortiums discussions, technology demonstrations etc.

Here are some important elements to look out for when drafting or negotiating your NNN agreement:

(1) Definition of “confidential information”: it is essential to precisely determine the scope of confidential information to which the contract will apply.

(2) Communication of confidential information: the contract should specify to whom the confidential information can be communicated and under what conditions. The agreement should also provide an obligation for the party concerned to obtain a formal undertaking of confidentiality from third parties before any communication of information and should clearly state that the party concerned is legally responsible for any subsequent disclosure of confidential information made by third parties to whom it has transmitted the confidential information.

(3) Duration of the contract: NNN agreements usually distinguish the duration of the contract (the period during which the exchange of information will create a confidentiality obligation) from the duration of the confidentiality obligation. The confidentiality obligation often extends beyond the duration of the contract and this should be determined depending on the expected life-cycle of the technology. Some NNN agreements provide for an unlimited period of confidentiality;

(4) Damage applicable in case of breach: it is recommended to set fixed damages to be paid by the party who breaches the contract. This acts as a deterrent against breaching the contract and will also allow the injured party to get compensation without having to establish the existence or the amount of damages it suffers. The amount of damages must correspond to the reasonably foreseeable damage at the signing of the contract. If this amount is disproportionate, the judge will have the authority to reduce it.

(5) Governing law and jurisdiction: NNN agreement should set the governing law and competent jurisdiction in case of breach of agreement. Different options are available. As it might be difficult and time-consuming to enforce a foreign judgment in China, it is generally recommended to give the jurisdiction to a Chinese court, however international arbitration is also a viable alternative. As for the applicable law, Chinese laws allow for a foreign law to govern a contract, however since Chinese courts will require the parties to prove every element of the foreign law, this can easily lead to long delays. It is thus recommended to designate Chinese law as the applicable law, which is well developed in protection of confidential information and contract law.
Given the importance of the information you may be disclosing to another party, you should tailor your contract to your business needs with the assistance of an experienced lawyer. Template contracts put your important IP at risk and should be avoided.

**What to do if a potential client refuses to sign an NNN agreement?**

In this kind of situation, it is important that you only disclose very preliminary product information. You must also be aware that such behavior is rather suspicious and that a potential client who is not willing to sign an NNN agreement is also a client that is most likely to steal your IP in the future.

Within the negotiations, you should always ensure that the contract stipulates the ownership of the IP as well as proper confidentiality provisions (by reference to the NNN agreement for example).

In general, it is also advisable to always conserve the evidence of transfer of information, so as to be able to prove prior possession of the information in case of breach of confidentiality.
6. Case Studies

Case Study No.2 – IP challenges with regards to Industry 4.0 technologies

The SME Z creates and commercializes games in China. These games include warrior figurines that have been protected by design patents in China. While monitoring internet blogs, the SME discovered that its figurines are massively copied by consumers using 3D printers. What happened and how can the SME enforce its rights?

This is the likely patent infringement scenario: an individual creates a CAD file of the patented figurine by scanning it without the SME Z’s authorization. Then, the individual uploads the file online where other users download it and print the figurine using a 3D printer. In this scenario, as the patented object itself is never sold, it makes the infringement difficult to prove.

In a typical case of patent infringement, in order to enforce their rights, the patent owner sues the manufacturer of infringed goods. Under patent law, manufacturing, using or selling of patented products without authorization of the right owner can constitute a direct infringement, but only where it is done for production or business purpose. In the current scenario, manufacturers are individuals printing the figurine for their personal use, so, even if the SME Z can identify each of them – which will be challenging given the massive proliferation of 3D printers, they may not be qualified as infringers.

Regarding the person who created and shared the CAD file, it will also be difficult to prove the direct infringement. This person is not “manufacturing, using or selling” the patented object, but making and distributing a CAD file which allows users to print the figurine. The patent owner can try to sue him for contributory infringement, as made possible by the Supreme Court’s interpretation in 2016. However, the qualification of contributory infringement applies only where someone knowingly provides a component that is dedicated to the exploitation of a patent. Here the CAD file does not strictly constitute a component of the patented object. As a result, as for any online IP infringement, it may be difficult for the SME Z to obtain a protection of its rights. And even if the infringement qualification can be obtained, identification of the defendants, as well as evidence collection and damage calculation will also be an issue. This scenario shows again the challenges encountered to apply IP law concepts to Industry 4.0 new technologies.

Case Study No.1 – the importance of well-drafted patent description

The SMEX is specialized in contactless input screen. It has developed an innovative technology consisting of a pixel array of contactless input panel, which included a plurality of pixels, each pixel including a sub-pixel and a positioning pixel on a side of the sub-pixel. SME X has filed a patent application to protect such technology but its application was rejected by the China National Intellectual Property Office.

While reviewing the claim, the Patent Reexamination Board (PRB) held that the invention merely provided a human-specified construction of a pixel array, which did not constitute a technical means, could not solve a technical problem and could not achieve a technical effect, as it is required by the patent law. Thus, according to the patent law, the invention was deemed not patentable.

As SME X was dissatisfied with the PRB decision, it filed a review before the Beijing Higher Court which re-examined the question of whether there was a technical problem solved by the invention. It found that a user of the SME’s new technology could input information through the panel without contact and that this invention was created to solve a technical problem of a contact panel being easily damaged under pressure. As a result, the Beijing Higher Court reversed the PRB decision.

This case shows the importance, when drafting a patent application, to connect the concerned invention with a technical scenario so that the examiner could understand the technical problem solved by the invention. Moreover, if the description of the patent specifications is based on known technical effects such as efficiency, speed and reliability, it should be easily accepted. It is recommended that you use the assistance of experienced Chinese patent attorneys to properly draft such patent applications.
Register copyright to protect source codes, algorithms, databases, 3D printing CAD files and any Industry 4.0 works that are eligible to such protection.

Apply for patents to protect hardware as well as computer program inventions when they include technical features.

For inventions relating to algorithms, patent claims should include a technical feature and should be drafted in a manner that shows how the technical features and algorithmic features support each other and interact with each other.

Combine registered IP with trade secret protection by implementing confidentiality measures.

Do not underestimate contractual protection and sign a non-disclosure agreement with potential clients and suppliers before sharing any sensitive information.

Set proper internal guidelines and trainings regarding confidentiality so that employees are aware of their obligations and the penalties applicable if they are in breach.

To devise a comprehensive IP strategy, the assistance of an IP professional knowledgeable in Chinese laws and regulations is recommended.
7. RELATED LINKS

Patent Protection in China:

Guide to Copyrights in China:
https://www.china-iprhelpdesk.eu/sites/all/docs/publications/EN_Copyright_guide_Aug_2010.pdf

Guide to Protecting Your Trade Secrets in China:

Guide to Using Contracts to Protect Your Intellectual Property Rights in China:

Registering Copyright with block-chain technology UniTrust Time Stamp Authority - https://www.tsa.cn/
Industry 4.0 and IP Protection

The China IPR SME Helpdesk provides free, confidential, business-focused advice relating to China IPR to European Small and Medium Enterprises (SMEs).

HELPLINE Submit further questions to the Helpdesk via phone, email (question@china-iprhelpdesk.eu) or in person and receive free and confidential first-line advice within three working days from a China IP expert.

TRAINING The Helpdesk arranges training on China IPR protection and enforcement across Europe and China, tailored to the needs of SMEs.

MATERIALS Helpdesk business-focused guides and training materials on China IPR issues are all downloadable from the online portal.

ONLINE SERVICES Our multi-lingual online portal (www.china-iprhelpdesk.eu) provides easy access to Helpdesk guides, case studies, E-learning modules, event information and webinars.

Prepared by:

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