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# Intellectual Property Protection of Multinational Enterprises' Algorithm in Cross-Border Data Flows

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**Abstract.** Among the fierce AI competition of MNE, algorithm represent the core capability in the market. However, the increasing demands for transparency, driven by national security and privacy concerns, have significantly undermined the protection of these algorithms. The traditional method of safeguarding algorithms through trade secrets has become increasingly ineffective, contributing to the potential decline of numerous AI-focused multinational enterprises. In response to this dilemma, this paper argues for the innovation of algorithms to be recognized and established as a new category of intellectual property right. Key recommendations also include the enhancement of international cooperation and the development of a comprehensive government guidance framework. This framework emphasizes clear evaluative criteria, expert certification, efficient evaluation processes, protection of sensitive information, transparency, accountability, and international collaboration. By implementing these strategies, governments and regulatory bodies can foster an environment that protects MNEs' innovative capabilities while accommodating the public and regulatory demands for transparency and accountability in AI applications.

**Keywords:** Algorithm Protection, Intellectual Property Right, Cross-Border Data Flows, Multinational Enterprises.

## 1. Introduction

In the contemporary digital age, the phenomenon of cross-border data flows has become increasingly prominent, catalyzed by the rapid advancement of technology and the global expansion of digital economies. At the heart of this transformation are algorithms, the sophisticated computational procedures that underpin the vast majority of digital platforms and services operated by multinational enterprises (MNEs), exemplified by companies TikTok [1]. These algorithms, which range from simple code to complex artificial intelligence systems, are not only pivotal in processing and analyzing data but also constitute a significant part of the intellectual capital of these enterprises.

However, the collection and transmission of user data by MNEs, often across international borders and without proper authorization, pose significant privacy and national security concerns. In response to these challenges, host countries may require MNEs to disclose their algorithms as a measure to evaluate potential risks [2]. This disclosure, though aimed at ensuring transparency and security, introduces a set of complex issues. Competitors obtain the opportunity to imitate MNE's commercial model due to the public of algorithm, therefore MNE may lose its competitive capabilities and predicted revenue. Also, the innovation of algorithm is discouraged under this circumstance. Moreover, the abuse of algorithm may occur since to the high-tech algorithm accessed to public. Thus, the protection of algorithm is necessary and indispensable. Safeguarding these critical assets is not only vital for maintaining the competitive position and innovative capacity of MNEs but also for ensuring the integrity and security of digital ecosystems worldwide.

In general, there are three methods of algorithm protection under intellectual property law: patent, copyright, and trade secret. The protection under patent requests the combination of algorithm and object. Copyright protection is the prohibition of copy, which is distinguished with the essence of algorithm, to achieve its function. Meanwhile, with trend of algorithm public, the protection of algorithm under trade secret become meaningless. With the offer of exclusive right under Trans-Pacific Partnership article18.50, it might be a fourth choice to address the algorithm protection. Under

this treaty, without the consent of the person who previously submit information to the test, any third party may not allow to market the same or a similar product at least five years [3]. The evaluation of risk regarding algorithm also can apply exclusive right to address its conflict. However, all of these contribute to limitation of algorithm protection.

The primary aim of this study is to explore the current legal frameworks and protections available for the algorithms of multinational enterprises, assess their efficacy, and identify the gaps that exist in the protection of such vital intellectual assets. This essay contends that the push for algorithm transparency in legislation is inadequately balanced, lacking sufficient protective mechanisms for the algorithms themselves. This essay will start with the illustration of algorithm in MNE. Then, it follows with the discussion of limitation and challenge in protecting algorithm. Finally, the suggestions of algorithm protection will be proposed.

## 2. The Definition of MNE's Algorithm

### 2.1. The Definition of Algorithm

Before the illustration of algorithm protection, the definition of AI and algorithm should firstly be given.

AI is an umbrella term that describes technologies and programs that rely upon algorithms to learn over time as they are exposed to more data. AI is typically used as a tool for decision-making when it comes to using acquired data to make predictions. "Black box" AI and "explainable" AI are the two types of AI models. A concept known as "explainable AI" allows a programmer to examine a computer's output and comprehend the reasoning behind the machine's decision. Black box artificial intelligence (AI) refers to computer-generated algorithms that are multi-layered and overlap and do not adhere to specified inputs or weightings, making it impossible for anyone to understand how the computer makes such decisions [4]. Parts of algorithms in Tik Tok is black box which raised privacy issues and security concerns.

Algorithm is the brain of AI to set up rules and introductions of analyzing data and achieving outcomes [5]. The American Data Privacy and Protection Act, reported on December 30, 2022, introduces the term "covered algorithm" [6]. It refers to any computational process or technique that utilizes machine learning, natural language processing, artificial intelligence techniques, or other similarly complex computational methods [7]. Such algorithms play a crucial role in decision-making or in facilitating human decision-making concerning covered data.

There are four elements involved in Algorithm: the inputs, weightings, data sets and outputs. The inputs set up a formula, and the weightings offer each facts a proportion in this formula, then the date collected will be applied to get the outputs.

### 2.2. MNEs' Algorithm

During recent decades, there are dozens of MNEs such Factbook, Twitter, TikTok merged. Those MNE called social media. They rely on apps or internet, establish a digital various social environment with numerous people engaged. It depends on various technologies which facilitate the sharing of ideas and information among their users [8]. Algorithm is the key of such MNE in terms of operation and promotion.

For instance, TikTok, as one of the Top 10 Social Media Platforms Worldwide [9], owes much of its success to its "For You Page" and the sophisticated algorithm that curates content for it. [9] The algorithm of TikTok dynamically suggests videos to users based on a range of influential factors, including user interactions, video information, and device and account settings. This system is designed to predict user interests and adapt recommendations accordingly, even for users who have not explicitly indicated their preferences, as shown is Fig.1.

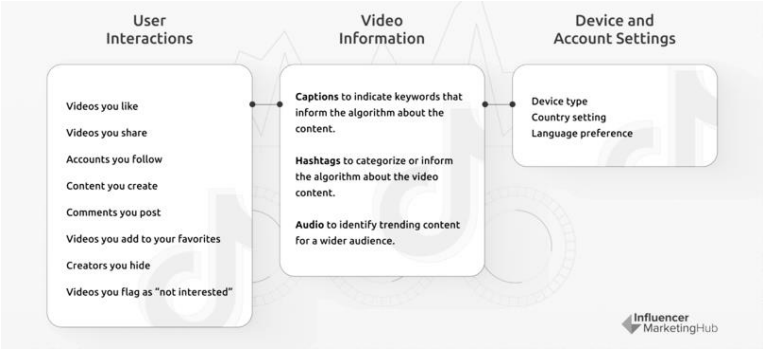


**Fig. 1.** Influential Factors on the TikTok Algorithm.

Notably, the exact formula used by TikTok to weigh and input these factors remains undisclosed, as pointed out by Chris Stokel-Walker, author of TikTok Boom. Unlike other recommendation algorithm, Tik Tok algorithm does not wait for users to indicate their preferences but proactively predicts and tests these preferences, contributing significantly to the platform's success [10].

## 3. The Intellectual Property Protection of Algorithm

### 3.1. The Protection of Algorithm under Patent

A patent is an exclusive right grant for an invention, which is a product or process that provides, in general, a new way of doing something, or offers a new technical solution to problem [10]. Algorithm might be protected under patent when satisfying certain conditions. However, there is no uniform standard all over the world, different countries hold different options.

In America, generally, algorithm is considered as mathematical formulas and cannot be subjected to patent. However, if an algorithm is applied in a specific, non-obvious, and useful way, it may be eligible for patent protection [11]. The case of Arrhythmia Research Technology, Inc. v. Corazonix Corp, even the Simson patent was defined to mathematical algorithm rather than statutory subject matter. It still can be protected under patent. According to the Act, if a "process" meets its criteria, it is eligible for patent protection [12].

In China, according to China Unveils Guidelines for Patent Examination 2023, It is clarified that Patent protection is applicable to an algorithm if it solves a technical problem of enhancing hardware computing efficiency or execution effect, has a specific technical relationship with the internal structure of the computer system, and produces a technical result of enhancing internal system performance that complies with natural laws [13].

In Europe, Guidelines for Examination in the European Patent Office 2023, shows that, in general, computer programs are not eligible for patent protection under Art. 52(2)(c) and (3), except for those that are technical in nature [14].

Thus, algorithm commonly excluded from the patent protection, unless it is specific and satisfied with patentable innovation, or make relationship with software, or has technical character.

### 3.2. The Protection of Algorithm under Copyright

Copyright is a type of intellectual property that protects original works of authorship as soon as an author fixes the work in a tangible form of expression [10]. The subject of software under copyright is similar to algorithm. However, the application of protection under copyright is verified due to the differences between software and algorithm. software is essay to be copy, and it may lose its value due to the copy action. However, the essence of algorithm is to make a decision or prediction and eventually achieve its purpose. The copy of such algorithm may not conduct same results, while the other algorithm without copy may achieve the same results. Thus, the protection of copy is not enough to protect algorithm.

### 3.3. The Protection of Algorithm under Trade Secret

Algorithm protection under trade secret is a common method which applied universally.

In America, trade secret under Trade Secrets Act 2016 should satisfied: (1) The information's owner has taken reasonable steps to keep it confidential; and (2) the information has independent economic value, either actual or potential, because it is not widely known to, nor easily ascertained by, another party who could profit financially from its disclosure or use.

In China, there is a case (Shenzhen Intelligence Technology Co., Ltd. and Shenzh Intelligence Co. Ltd. Commercial secret infringement dispute case) firstly indicates that algorithm can be protected under trade secret in 2022. In this case, the core of the algorithm is model selection optimization, even if the technology used is a public model, but if the specific model selection and weighting are the right holder's technical results after the collection, processing and testing of big data, constitutes the best option, and is not known to the public, it is possible to protect it as a commercial secret.

In the United Kingdom, three standard components of a trade secret claim are shown by the Uniform Trade Secrets Act: (1) The topic at hand needs to be eligible for trade secret protection (for further information, go to "Scope" below). (2) The person in possession of the subject content has to prove that appropriate measures were done to keep it secret. (3) The owner of the trade secret must demonstrate that the data was improperly or misappropriatedly obtained [15].

However, the protection of trade secret only limit to unfair competition and commercial use [16]. With the requests of transparency in AI law, the algorithm has to be public for the evaluation of risk. The protection under trade secret is no more applicable on such circumstance. Meanwhile the lack of exclusive right in trade secret also makes this situation worse.

## 4. The Challenges of MNE’s Algorithm Intellectual Property Protection in Cross-Border Data Flows

### 4.1. The Conflict between Algorithm Protection and Algorithm Public

Nowadays, with the rapid development of AI, a large number of issues are arisen in regard with algorithm, which is the core of AI. On the one hand, algorithm is protected under intellectual property protection when satisfying the specific requirements. Especially under trade secret, algorithm is protected as confidential information and other parties cannot benefit from the disclose or use of it. On the other hand, transparency and public requirements introduced into legislation since to privacy and national security issues occurred through the utility of algorithm. In order to make sure the safety operation of AI, Europe AI Act published on August 6th of 2023, which sets up compliance requirements regarding transparency Generative AI, like ChatGPT, even it will not be considered high-risk, but will have to comply with EU copyright law and transparency requirements [17].

However, this act is lack of the algorithm protection under intellectual property right. It suggests that the government should establish guidance in regard to the compliance of transparency while protecting intellectual property rights and trade secrets.

### 4.2. Legal and Regulatory Heterogeneity Across Jurisdictions

A significant challenge in protecting the intellectual property of algorithms for MNEs stems from the legal and regulatory heterogeneity across jurisdictions. Different countries and regions have disparate standards and requirements for intellectual property protection, particularly concerning algorithms and software. For example, the criteria for patentability of algorithms vary significantly between jurisdictions, with some countries allowing patents for software-related inventions more liberally than others. This inconsistency poses a challenge for MNEs seeking to secure comprehensive global protection for their algorithmic innovations.

The protection of algorithms is intricately linked to data protection and privacy laws, especially for algorithms that process personal data. Jurisdictions such as the European Union, with its GDPR, impose strict requirements on data processing activities, including those involving algorithms. These regulations may mandate transparency about the functioning of algorithms and the logic behind automated decision-making, potentially conflicting with the desire of MNEs to protect their algorithms as trade secrets or proprietary information.

In addition to the challenges posed by varying IP protections and data privacy laws, MNEs also face increasing demands for algorithm transparency and accountability. Some jurisdictions are enacting or considering regulations that require companies to disclose certain aspects of their algorithms to ensure they are fair, non-discriminatory, and do not violate users' rights. While such measures are aimed at safeguarding public interests, they can complicate the efforts of MNEs to protect their algorithms as confidential business information.

### 4.3. Case Study: the Dilemma of TikTok Algorithm Protection

The case of TikTok in the United States encapsulates the intricate challenges multinational enterprises face in protecting their algorithms amidst cross-border data flows. This dilemma has persisted over five years and remains unresolved.

On August 6, 2020, President Donald J. Trump signed Executive Order No. 13942, citing unauthorized collection of personal and proprietary information by TikTok and potential tracking by China, raising concerns over national security and the benefits to the Chinese Communist Party. The order mandated a halt on transactions with TikTok's parent company, ByteDance Ltd., within 45 days. Subsequently, on November 12, 2020, President Joseph R. Biden Jr. signed Executive Order 13959, highlighting the threats posed by Chinese surveillance technology to U.S. national security, foreign policy, and economy, specifically banning U.S. investments in Finance Communist Chinese Military Companies.

The main aim of United Nation is to force Tik Tok to sell its shares to American company. Subsequently, besides Software, Oracle and Walmart also intended to purchase TikTok. As a response, TikTok American made a cooperation with American company: Oracle corporation. TikTok chose to store its data on it [18]. Oracle would house all of TikTok’s data on US users and take the dramatic steps of reviewing its source code and submitting its app store updates [19]. Meanwhile, TikTok splits into TikTok American and TikTok Chinese. TikTok American became a subsidiary of Chinese company called Byte Dance. Instead of selling ownership, it promised a $5 billion education fund in American in 2020 [20].

China's government also responded to the American case of TikTok. On August 28, 2020, the Chinese Ministry of Commerce and the Ministry of Science and Technology adjusted and issued the "Catalogue of Technologies Prohibited or Restricted from Export of the PRC." The Catalogue includes 23 technology items that are banned from export, including a personalized information push service technology based on data analysis, which means that TikTok cannot export unless the Chinese government agrees. Frankly, Chinese government does not allow TikTok to sell its algorithm.

Legal challenges ensued as TikTok contested the U.S. government's sanctions, leading to temporary suspension of Trump's executive order by the United States District Court for the District of Columbia on September 27, 2020. Litigations tested TikTok's data collection practices, including its algorithm's role in processing biometric data, prompting discussions about algorithm transparency and protection:

(1) The ambiguity surrounding ownership of algorithms, especially those developed through "black box" AI, poses questions about proprietary rights;

(2) The ethical considerations in disclosing algorithms and the honesty of such disclosures;

(3) The protection of publicly disclosed algorithms in a fair market, especially when they no longer qualify for trade secret or IP law protection;

(4) The establishment of rules for maintaining algorithm confidentiality by experts or other personnel involved.

The recent enactment of the Protecting Americans from Foreign Adversary Controlled Applications Act on March 14, 2024, further complicates the scenario by banning foreign adversary-controlled applications, indirectly forcing TikTok to divest to an American entity or shut down. Given the Chinese government's prohibition on algorithm export, TikTok's future in the American market appears bleak, showcasing the complex interplay between national security, international trade, and IP rights in the digital age.

## 5. The Suggestions of MNE's Algorithm Intellectual Property Protection in Cross-Border Data Flows

### 5.1. The Implication of Legislation

As the limitations motioned in Chapter3 and 4 of the article, algorithm should be created as an independent type of intellectual property to be protected under intellectual property law. Algorithm commonly excluded from the patent protection, unless it is specific and satisfied with patentable innovation, or make relationship with software, or has technical character. The protection of algorithm under copyright is limited to the copyright and regardless of its value. Trade secret only protect algorithm on the circumstances of unfair competition and commercial use. With the requests of transparency in AI law, the protection under trade secret become useless with the algorithm disclosing in risk evaluation. Thus, it is necessary to independent algorithm as a new type of intellectual property.

Under this classification, different protection period may offer due to the characteristic of algorithm innovation. The EU risk-based approach under EU AI act also can apply to algorithm innovation regarding the period definition and market security. Moreover, if the algorithm is requested to disclose in the risk evaluation processes, the exclusive right might confer to algorithm owner as a compensation and to avoid the unfair competition.

### 5.2. The Enhancement of International Cooperation

In today's global landscape, many countries opt to restrict foreign-controlled companies to safeguard domestic data storage. Notably, efforts by the United States to acquire ownership of the American branch of TikTok, a subsidiary of the Chinese company ByteDance, and China's prohibition against the sale of TikTok's algorithm illustrate the complexities MNEs face, potentially threatening their operations.

How to maintain control on foreign subsidiary's algorithm of MNE as well as transfer ownership of subsidiary to local company would be an essential problem. There is "golden share" in UK, the government held 1 pound and its nominee in such MNE, so that special affairs only can be processed by the consent in writing of shareholder. If algorithm can be set as an intellectual property right owned by the mother company Byte Dance in China, even if the subsidiary American TikTok sold to local company, the use of algorithm only can be processed by the consent of Byte Dance. This might be a second choice for TikTok American to figure out this dilemma.

To extend, this environment is not friendly for the thrive of AI related MNE. This situation is similar to the beginning history period of cross broad trade. When cross broad trade merged and prosperous developed, host countries make strict rule to limit MNE free trade in case of situations like monopoly. Gradually, various of free trade agreement signed by different countries in order to achieve community of interest. International cooperation is the still the best and last method. Therefore, the cooperation among nations such as signing international treaties should be enhanced.

### 5.3. The Framework of Government Guidance

In EU AI act, it suggests that the government should establish guidance in regard to the compliance of transparency while protecting intellectual property rights and trade secrets. Specially, the safeguard of algorithm should be established. In TikTok American case, the evaluation of whether its algorithm used to collet privacy information was mainly conducted by two computer experts. The TikTok company granted to offer its algorithm so that the experts can test its functions. However, the discretion of the experts is too much due to the absence of criteria. Since to highly professional acknowledge involved in the evaluation of code, only a few experts can meet this requirement. Meanwhile, it usually took months for experts to read this code and to make the test. Bias or mistakes is extreme likely to appear in any section of this evaluation. Also, the lack of algorithm secret protection may lead to the disclose of core algorithm.

Therefore, it is necessary to set up guidance to make sure substantive justice and procedural justice. Additionally, the introduction of an expert certification process is crucial, ensuring that those responsible for algorithm assessment are not only highly knowledgeable but also adhere to stringent ethical standards. The framework must also include the development of methodologies that streamline the evaluation process, enhancing efficiency without sacrificing depth of analysis, potentially through the adoption of automated tools or simplified procedures. Equally important is the implementation of measures to protect sensitive information, ensuring that proprietary algorithms remain confidential throughout the evaluation process to prevent unauthorized access or misuse. Transparency and accountability should be maintained, balancing the protection of trade secrets with the need for public trust and oversight. Finally, fostering international collaboration is essential to standardize evaluation protocols across borders, providing multinational enterprises with consistent and predictable regulatory environments.

## 6. Conclusion

The balance between ensuring transparency and protecting the intellectual property rights of MNEs in the realm of cross-border data flows represents a pivotal challenge in the digital age. As this paper has illuminated, the path forward demands an approach that reconciles the need for open and accountable AI applications with the imperative to safeguard the innovative algorithms that underpin these technologies. The case studies and thematic explorations within this paper have underscored the complexity of these issues, highlighting the dilemmas faced by entities like TikTok amidst evolving regulatory landscapes and international tensions.

The recommendations outlined, including the establishment of algorithms as a distinct category of intellectual property, enhancing international cooperation, and developing a comprehensive framework for government guidance, offer strategic pathways to navigate these challenges. They emphasize the importance of clear legislative implications, the need for a harmonized approach to legal and regulatory frameworks, and the value of international collaboration in crafting policies that support both innovation and accountability.

As the digital economy continues to evolve, the role of algorithms as both drivers of innovation and focal points of regulatory scrutiny will only grow. It is imperative that policymakers, legal experts, and industry leaders work together to create an environment where the benefits of AI and data-driven technologies can be realized while managing risks and ensuring the ethical use of these powerful tools.

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