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# Big data and intellectual property rights

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**Abstract**
Input data is considered an essential element in the development of AI. Big data is crucial for an AI system to operate smoothly and efficiently. Big data plays a vital role for business entities due to its informational advantages. Therefore, the protection of Big Data is a legal issue that needs to be ensured. The article analyzes the roles of Big Data. Besides, from the perspective of intellectual property, the article affirms that big data can be protected in the form of (i) copyright and (ii) business secret (subject to industry rights). The article points out the international and national legal basis for protecting big data from the perspective of copyright and business secret. The article also points out the difficulties in protecting big data from the perspective of copyright and trade secrets. From there, the article recommends setting up a separate adjustment mechanism for big data to match its characteristics.

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## 1. Introduction

Data is "a representation of information that can be understood formally, suitable for communication, interpretation or processing" (ISO/IEC, 1993) [9]. This definition includes many data types, including geographic information, statistics, weather data, and research data. Even so, big data has many differences from traditional data in that the speed of the feed has increased to the point where it qualifies as a new data source. Traditional data is structured data, while Big data is considered unstructured data. Traditional database systems use structured data, where records are divided into well-defined 'fields' (such as 'name' and 'address') that can be easily searched, sorted, and sorted by specific criteria. Meanwhile, unstructured data needs a well-defined format.

Data is vital to the survival and competitive advantage of business entities. "People do not understand that data is now a commodity and will be more valuable than assets (Shaw, Jonathan, 2014) [19]. "Over the past three decades, data has become vital to every aspect of human life; it has changed how we are educated and entertained and shaped our perception of people, businesses, and the wider world. It is the lifeblood of our digital existence, evolving at breakneck speed. While we, as consumers, will reap the benefits of digital presence, businesses worldwide will capture new and unique business opportunities powered by rich data: this resource and the detailed information it provides. The volume and importance of real-time data are astounding - from power grids and water systems to hospitals, public transport networks, and roads. While data was once solely responsible for successful business operations, it is now a vital component of the smooth functioning of all everyday life for consumers, government, and business".

With such a role, protecting big data is essential for business entities. Regarding intellectual property law in terms of copyright and trade secrets, big data can be considered.

## 2. Hypothesis and Research Methodology

The current intellectual property framework may already have regulations for Big Data. However, it is insufficient to meet the needs of the current advances in the data economy.

- Regulation and data protection in the current context regarding copyright and trade secrets;
- A regulatory paradigm shift is needed for big data.

The article is purely theoretical or non-empirical. The data collected is both primary and secondary. Laws and case law will be primary sources to understand intellectual property rights, ownership, protection, and data management. In contrast, articles, books, and reports published by various committees and institutions will be used as secondary sources. Collected data are summarized and interpreted according to the requirements of the research problem. Analytical and deductive research methods will be used.

## 3. Research and Discussion

### 3.1 Big data overview

#### 3.1.1 Concepts and features

Big data sets' origins date back to the 1960s and 197,0s when the data world began with the first data centers and the development of related databases. Dữ liệu lớn đề cập đến dữ liệu quá lớn, nhanh hoặc phức tạp đến mức khó hoặc không thể xử lý bằng các phương pháp truyền thống. Big data can be defined as "representations of information that are characterized by their large volume, speed, and variety for which they require specific technologies and analytical methods to convert them into value." In addition, Big Data "generally includes data sets larger than the capacity of conventional computer programs to capture, process, manage, and process within an acceptable amount of time."

The concept of big data was approved in the early 2000s when industry analyst Doug Laney gave the current orthodox definition of big data as the three V: Volume, Velocity, and Variety, where:

1. **In terms of Volume:** Organizations collect data from various sources, including transactions, intelligent devices (IoT), industrial devices, video, images, audio, social networks, and more. In the past, storing all that data would have been relatively inexpensive. Storage is now convenient and lighter in cost by using data lakes, Hadoop, and cloud algorithms that have eased this burden.
2. **In terms of Velocity:** With the development of "The Internet of Things," data flows into businesses at an unprecedented rate and must be processed promptly. RFID tags, sensors, and intelligent meters drive the need to process these data streams quickly (SAS, 2022) [4].
3. **In terms of Variety:** Data comes in various formats, from numeric, structured data in traditional databases to unstructured text documents, email, video, audio, ticker data, and financial transactions. The sources of data can be listed as follows:
4. **Web Data:** Data collected from customers' web behavior, such as page views, searches, reading reviews, and purchases. They can improve performance in the next best offer, customer churn, segmentation, and targeted advertising.
5. **Text data:** This is one of the most popular and widely used types of big data. Emails, news, Facebook feeds, and documents are examples.
6. **Time and location data:** GPS, mobile phones, and Wi-Fi connections contribute to time and location data growth. On an individual level, many organizations realize the value of knowing where and when their customers are. Equally important is the aggregated view of time and location data. As more and more people made their time and location data publicly available, countless interesting applications emerged. Time and location data is one of the most privacy-sensitive types of big data and should be handled cautiously.
7. **Sensor data and intelligent grid:** Sensor data is frequently collected from cars, oil pipelines, and wind turbines. Sensor data contains a wealth of information about engine and machine operation. It allows faster problem diagnosis and the development of mitigation procedures.
8. **Social network data:** In social networking sites like Facebook, LinkedIn, and Instagram, link analysis can be used to infer a user's network. Social network analysis can shed light on ads appealing to specific users. This is done by considering not only the customer's stated preferences but also their friends or colleagues.

How "Big Data" is created and used can be divided into two phases. First, making big data warehouses requires processes to collect data from sources. Second, the corpus is analyzed, which may involve Data and Text Mining (TDM). TDM is a process that uses Artificial Intelligence (AI) algorithms. It allows machine learning from the data warehouse. When it analyzes a large data store, the machine learns and does better at what it does. This process often requires human input to assist the machine in correcting errors or faulty correlations derived from data-driven decisions. This Big Data aggregation processing is done to find correlations and generate predictions or other valuable analytical results. These correlations and insights can be used for various purposes, including ad targeting and monitoring. For example, a law firm might process hundreds or thousands of documents in a given field, combine them with human expertise, and generate insights into how they and other firms work, such as negotiating a specific type of transaction or settling cases.

Organizations must create value and achieve their goals by adapting their operating model to handle daily data. However, processing and analyzing such a large volume of heterogeneous records using conventional tools and methods is impossible, as batch parallelization techniques are required. Therefore, it is necessary to introduce new techniques compatible with new standards. These methods and tools are known as Big Data analytics. Big Data Analytics examines raw data, often in large quantities, to extract humanly understandable information but is difficult to observe directly. Big Data Analytics proposes a set of tools for interacting with data in various states.

#### 3.1.1 How Big Data Creates Values

"Big data does not by itself have any value. People often assume that storing data creates value when, in fact, that never happened. Big data is only valuable when you can better understand the data, and that insight can be used to build your decision-making. The power of big data lies in the analysis performed and the actions taken due to the findings". Organizations will integrate and analyze data from various sources, including social media, video, and intelligent mobile devices. Mining value from big data is a multi-stage process that starts with raw data and ends with helpful information. For a long time, organizations have obtained valuable information by combining mathematical modeling and sifting through vast amounts of data. Once refined, big data

complements existing models and can provide new insights for business intelligence applications. While the data comes from various sources, new insights are gained through integrated analysis of all available data.

There are four major categories through which Big Data analytics can be designed and conducted: prescriptive, predictive, diagnostic, and descriptive. Companies can find correlations, identify patterns, and generate actionable insights through any of these. Descriptive analysis provides insight into the past and remembers what happened; Predictive analytics aims to analyze scenarios of what might happen; Diagnostic study identifies patterns in data to determine the viability of a project; Rule-based analysis determines which decisions should be taken into account.

This is the most valuable type of analysis, as it often generates rules and recommendations for next steps; Diagnostic analytics allows identifying the causes of performance gains by looking into the past (Mandeep Kaur Saggi & Sushma Jain, 2018).

Big data can benefit every industry and every organization. Big Data use cases in different sectors categorized by industry are Manufacturing (Predictive maintenance, Operational efficiency, Production optimization); Retail (Product *et al*. Experience, Customer Lifetime Value, In-Store Shopping Experience, Pricing Analysis, and Optimization); Healthcare (Genome *et al*. Experience, and Outcomes, Fraud Claims, Healthcare Billing Analysis); Oil & Gas (Predictive Equipment Maintenance, Oil Search and Detection, Oil Production Optimization); Telecommunications (Optimizing network capacity, Tendency to leave telecom customers, Providing new products); Financial Services (Fraud and Compliance, Promoting Innovation, Anti-Money Laundering, Financial Regulation, and Compliance Analytics); Optimization of Transportation (Logistics, Anti-traffic jam); Digital Media (Real-Time Advertising Targeting, Web Analytics) (Top Big Data Analytics Use Cases, 2020) [15].

Big data enables organizations to leverage existing, transient, and externally available data sources to create additional value, leading to more informed decision-making and treating data as a tradable and marketable asset (Ian Mitchell, 2012).

Some specific examples of how to exploit the value of big data are as follows:

- Websites may create small data called cookies to identify the user; cookies may be used to record the user's browsing activity on that website. These cookies can then be shared, and the data in them merged to allow the advertising industry to follow broadcast, real-time, user preferences and usage patterns, and thus to create favorable conditions for online advertisers to place real-time bids for personalized advertising on browser page (Daniel Seng, 2021).
- Netflix deploys data analytics models to uncover customer behavior and buying patterns. Then, using this information, they recommend movies and TV shows to their customers. It analyzes customers' choices and preferences and recommends suitable shows and movies. According to Netflix, about 75% of viewer activity is based on personalized recommendations. Netflix often collects enough data to create detailed profiles of its subscribers or customers (Data Flair, 2022). This profile helps them better understand their customers and their business growth.
- Google uses big data to optimize and refine its core search and ad-serving algorithms. Moreover, Google constantly develops new products and services with big data algorithms. Google often uses big data from its Web index to match queries with potentially useful results initially. It uses machine learning algorithms to assess the reliability of the data and then ranks websites accordingly (Matthew Stewart, 2019). Google has optimized its search engine to collect data from us as we browse the Web and display recommendations according to our interests and preferences.
- Leading e-commerce company Amazon, Inc (Amazon) used its significant data source to improve performance. As the dominant retailer on the Internet, Amazon has a vast database of customers' tastes, preferences, and previous purchase history. Amazon has leveraged its big data to make more relevant product recommendations and improve customer care. Focusing heavily on big data, the company has upgraded the customer referral system.

### 3.1.3 The Role of big data

Big data can be used in almost any field and virtually any task. In general, three types of Big Data applications exist. To begin with, the application of Big Data to specific government mandates. Second, the private or semi-public sector uses Big Data to assist or enable them to accomplish their particular tasks or goals. Third, government and private sector companies use Big Data to improve their services to citizens or customers (WRR, 2016) [24].

According to IDC, nearly 20% of the data in the global data warehouse will be crucial to our daily lives by 2025, and almost 10% will be critically essential data (David Reinsel, John Gantz & John Rydning, 2017). These increasingly diverse data sets complement each other, allowing businesses to fill gaps and discover new insights. Filling these gaps improves operational decision making and provides the ingredients to improve business processes. In his article “The Age of Big Data,” Steve Lohr points out that technological advances pave the way for a new way of understanding the world and making decisions. (Steve Lohr, 2012). Gartner predicts that by 2016, 30 percent of businesses will use their information assets as currency, exchange, buy, sell, or sell them (Mark Beyer & Douglas Laney, 2012).

Big data allows businesses to gain insight into their users, customers, operations, supply chain, and competitive and regulatory environments. When used correctly, big data can dramatically improve business intelligence, services, and decisions. Big data analytics can help businesses reduce costs and gain a competitive advantage (Oracle, 2012) [16].

The impact of data abundance has far-reaching effects beyond the business realm. Decisions in business, economics, and other fields will increasingly be based on data and analysis rather than experience and intuition. The predictive power of Big Data is being explored - and shows great promise - in areas such as public health, economic development, and economic forecasting (Steve Lohr, 2012).

### 3.2 Ability to protect big data under intellectual property law

#### 3.2.1 Big data protection from a copyright perspective

Copyright is a legal term that refers to an author's rights to their literary and artistic works. Copyright protects many jobs, including books, music, paintings, sculptures, and films, as well as computer programs, databases, advertisements, maps, and technical drawings.

The leading international instrument in the field of copyright is the Berne Convention for the Protection of "Literary and Artistic Works." Berne Convention protects data collection (although the 1967 amendment to the Berne Convention does not explicitly address "electronic" databases). Thus, the "collections" mentioned in the Bern Convention can be construed as anthologies and encyclopedias. The convention aims to create a separate copyright for a collection's producer (or "arranger"). Most of the data collection content is generally written by third parties, experts in their fields, and each enjoys their copyright over a portion of the content in that collection. Thus, in a group of this type, there are two layers of copyright; first, the rights to each range in the group are transferred or licensed to the producer or publisher of the group, and second, copyright in what one might call the "organization tier," is granted to the creator of the group based on the "selection or arrangement" of individual items, photographs and illustrations odd. The second layer—collections such as encyclopedias—is often considered a collective work.

Article 2 of the convention provides for the protection of "collections" as follows: "Collections of literary or artistic works such as encyclopedias and anthologies which, by the selection and arrangement of content, are their content, constituting intellectual creations shall be protected as such, without prejudice to the copyright in each of the works forming part of such collections." Selection and arrangement are prime examples of what copyright scholars call "creative selection" (Daniel *et al*., 2009).

Next, Article 10(2) of the TRIPS Agreement and Article 5 of the WIPO Copyright Treaty (WCT) provide copyright protection for data sets or other materials constituting a creation. Intelligence "by their choice and arrangement." With such creativity, the database would be governed by the Treaty. The primary criterion is that the database is the product of the intellectual work of its creator and exhibits a sufficient degree of originality (V.K. Gupta, 1997). Anthologies are protected because they reflect the creator's creative contributions. If data sorting choices are not the result of creativity but merely a selection of habit (e.g., the option to alphabetize folders) or are significantly limited, told by external factors such as the function the work is intended to serve (e.g., providing precise driving instructions), the tools used to create it (e.g., marble and chisels), and standards of practice or conventions for a particular type of work (e.g., the structure of a sonnet) that are not creative are not eligible for protection.

Under the United States Copyright Law (17 US Code § 101), a composite work is defined as "a work resulting from the collection and assembly of pre-existing materials or data selected, coordinated, or arranged." arranged in such a way that the entire resulting work constitutes an original work of copyright. The term compilation includes collective works." The compilation of purely factual information is not protected by copyright. Instead, a compilation can only be copyrighted if it contains a creative or original act, such as selecting and arranging materials. Protection is limited to the creative or original aspects of the compilation (17 US Code §103).

The United States Supreme Court, in the landmark case Feist Publications, Inc. v. Rural Telephone Service Co., Inc. (US Supreme Court, 1991) [23], asked for evidence of the author's creative expression in the selection and arrangement of a factual compilation. The case involved raw data, namely the names and addresses of subscribers listed in the phone book. The United States Supreme Court has established two clauses: (a) facts are not copyrighted, and (b) facts are aggregated. The Supreme Court held that the compilation must contain some unique elements, even if it was minimal.

The European Union Databases Directive (THE EUROPEAN PARLIAMENT, 1996) provides copyright protection for databases within the European Union. The Directive applies to compiling data, including hard copies and electronic databases. The copyright portion of the Directive, Chapter II, which applies only to the structure or schema of the database, does not affect any existing copyright protections for the contents of the database. According to the Directive's standards, a database must "constitute the intellectual creation of its author" through "the selection or arrangement of its content.".

In the United Kingdom, since 1985, computer programs and design documents prepared for a computer program have been protected as literary works. Moral rights apply to copyrights of literary works but not to software (Richard Kemp, 2014).

In Vietnam, according to the provisions of Clause 1, Article 14 of the Law on Intellectual Property 2005 (amended and supplemented in 2009, 2019, and 2022), data collection is a type of copyright protection. Clause 2, Article 22 defines data collection as a collection of creativity expressed in selecting and arranging documents in electronic or another form. Copyright protection for data collection does not cover the materials themselves, without prejudice to the authorship of the materials themselves.

Copyright protection for data collections such as the above applies to big data. Significant data controllers frequently need to distinguish and correlate the data they collect. Although the volume of data is vast and constantly changing, it reflects the value preferences of those in control of big data. As a result, the extensive data information obtained by data users from different significant data controllers is often dissimilar and even arranged in terms of the arrangement, which naturally reflects the choice of substantial data controllers and organizes their information by the original requirements of the compiled work. As can be seen, copyright protection for big data is a viable option (Meng Lu, 1963).

#### 3.3.2 Big Data and Trade Secrets

TRIPs, Art. 39.2: undisclosed information (UI) must:

a) Be “secret in the sense that it is not

• As a body or in the precise configuration and assembly of its components,

• Generally known among or readily accessible to persons within the circles that usually deal with the kind of information in question;

b) Have commercial value because it is secret; and

c) Have been subject to reasonable steps under the circumstances (...) to keep it secret”.

TRIPS, Art. 39.2: person in control can prevent acts made by others

• "Without the owner's consent,
• in a manner contrary to honest commercial practices",

The Trade Secrets Directive (2016/943) has somewhat harmonized the protection of trade secrets in the European Union. Protection of the European Union Trade Secrets Directive (2016/943) extends to databases; their underlying data and insignificant parts of the database are protected. Although the Trade Secrets Directive and the Database Directive overlap, both are complementary (Richard *et al*., 2019).

State and federal law (statutory (UTSA) and common law) govern trade secrets in the United States. The US Trade Secrets Protection Act protects data aggregation. Databases are widely recognized as potential trade secrets, and this protection can also extend to the underlying methods used to collect, select, and refine databases. For example, obtaining a trade secret through reverse engineering is not prohibited by law (Richard *et al*., 2019).

In Vietnam, Clause 23, Article 4 of the Law on Intellectual Property 2005 (amended and supplemented in 2009, 2019, and 2022) stipulates that "Business secret is information obtained from financial and intellectual investment activities. intellectual, undisclosed, and commercially usable". Article 84 also provides that a trade secret is protected if the following conditions are met: (i) Not common knowledge and not easily obtained; (ii) When used in business, it will give the holder of a business secret an advantage over those who do not hold or do not use such trade secret; (iii) Secured by the owner by necessary measures so that the trade secret is not disclosed and not easily accessible.

Big data can satisfy the constituting requirements of a trade secret for the following reasons:

First, big data fulfills the confidentiality requirement because the essence of big data is collecting information. Users are willing to provide their information to the significant data controller, subject to a confidentiality agreement signed by both parties. Of course, those who control big data, based on market competition, also keep the collected data confidential in case a competitor captures the market advantage.

Second, the commercial value of big data is obvious. In the global economic wave, massive big data is the magic weapon of a country and business. The purposeful development and analysis of these data is a valuable source of information, beneficial to the scientific decision-making of firms and governments. Not only that, people who control big data can also sell big data for profit, with a substantial amount of economic value. Finally, regarding security, significant data controllers often improve the safety of extensive data management through system upgrades to prevent hackers from entering and leaking data. In short, trade secrets may protect big data.

## 4. Conclusion and Recommendation

As analyzed above, big data can theoretically protect copyright or trade secrets, but it still needs to improve its practice.

First, the purpose of copyright is to protect the originality of a work, and the collection and collation of information on big data reflect essence to varying degrees. It is easy for people who control big data to ignore data organization in pursuit of quantity, so big data cannot satisfy the requirements for originality. At this time, the essence of big data is low and may not be able to meet the originality requirement in copyright law.

Second, for a work to be protected, it must be fixed in some (concrete) physical form. In this context, "fixation," in the context of data, means specific information that needs to be stored in a tangible form. How data is saved can vary from handwritten notes (files), through photographic documents (images) or recorded testimony (audio) to digitized archives (digital files). It can be easily identified and described as long as it is specific. Results that have not been generated (future data) or cannot be defined (e.g., because there is no means of expressing them) cannot benefit from copyright protection as long as they have not been specified. This can cause difficulties in the significant data context, as big data involves dynamic datasets and mainly depends on cloud computing services.

Third, in the data environment, the most crucial obstacle posed by copyright protection is the need to obtain permission from the copyright holder for individual data. In the context of big data projects, where copyright applies, it would require identifying the author of hundreds (if not hundreds of thousands) of works. In many cases, it can be challenging to identify or locate the right holder and understand whether they permit using the works. This means time-consuming analyses must be performed before the collected data can be used. As such, the critical issue to be addressed is the origin of Big Data. Since the internet is a space of many forms of communication, all kinds of information circulate in this medium, from text to images, videos, and computer programs. They are created and can circulate freely on the network. When a piece of this data is combined into the Big Data input value of some AI software, the origin of this data is often unknown. The possibility of causing this problem depends on the target of the application. Does a text or an image analyzed by the application belong to someone's copyright? The resources may be free or copyright protected. So when it comes to Big Data, AI's use of data is a matter of serious study to ensure that its application does not infringe on the intellectual property rights of others.

Fourth, identifying big data as a trade secret needs a precise and uniform standard. To what extent should the security measures significant data controllers take to be considered "reasonable"? How to determine the secret of big data? In the era of dramatization, users will leave traces of online shopping and browsing. Hence, collecting data information becomes more convenient and diverse, leading to a difference in the data collection. Determine the security of big data. Unfortunately, current legislation has not provided a clear answer to this question

The he development of big data changes people's lives in the present and leads to society's future growth. Therefore, building a model to protect extensive data intellectual property rights should be based on a long-term perspective. Although the copyright protection and trade secret protection of big data has some functional space, it is not a reasonable solution to improve the protection of intellectual property rights of big data. by expanding the scope of the copyright or changing the obligation to prove an infringement of a trade secret. Therefore, before the complex properties of big data, the author believes that as big data develops and matures, it is possible to define big data, a new type of intellectual property object, within the framework of the current intellectual property legal system.

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