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Engineering Ethical Risks Analysis Under the Lens of Big Data Technology

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Abstract: Big data has made social production and operation more efficient and provided people with more information. Its advantages come with ethical crises, like invading privacy, compromising fairness, and endangering safety. This paper investigates the dangers and influence of big data engineering, The solutions and protection measures to prevent and reduce the risk of engineering ethics are put forward to improve the security and reliability of big data engineering.

Keywords: Big Data; Use of Big Data Technology; Engineering Ethical Risks.

1. Introduction

Big data technology is gaining in popularity every year due to advancements in information technology and the Internet. Big data has advanced our economy and civilization, yet caused many ethical issues, such as privacy violations and lack of information security. Therefore, it is particularly important to find ways to neutralize the negative impacts of big data technology, to solve the engineering ethical problems arising from the development of big data, and to prevent and reduce engineering ethical risks.

2. Definition of Relevant Concepts

(1) Big Data and Big Data Technologies

Academics do not have a clear conceptual definition of big data, which is usually described as a collection of massive data. Li Guojie [1], a Chinese big data expert, defines big data as a collection of data that can't be processed quickly using traditional IT technologies. It is worth noting that behind these seemingly positive features there are also potential risks of big data ethics, such as higher barriers to the use of big data may exclude disadvantaged groups from its use; reusability may increase the risk of privacy leakage and provide a shortcut for privacy violations. [2]

Technology is the use of scientific principles and practical experience to meet real-life needs. From a technical perspective, big data technology is the ability to quickly and accurately separate useful information from a vast amount of complicated and disordered information. From an application perspective, big data technology is the technical activity of analyzing a large amount of data in order to predict the future development trend in a way that is reasonable and scientific. [3] Big data technology places an emphasis on the thorough analysis and correlation of data, but when compared to traditional data processing technology, its data analysis accuracy will be compromised.

(2) Engineering Ethical Risks

The concept of "risk" firstly appeared in Western capitalist societies in the 16th and 17th centuries, and was initially used to refer to navigating in dangerous waters, meaning "adventure" and "bravery". Later, the use of "risk" was gradually expanded to other social activities such as commercial trade and investment. Engineering risk mainly refers to a series of difficult to control or predict the adverse consequences or injuries caused by engineering activities. These adverse consequences or injuries can jeopardize nature and affect the development of human society.

Since engineering itself is a practical human activity, the occurrence of its risks is bound to be influenced by subjective human factors. In dealing with various issues in engineering activities, some ethical dilemmas and value problems may be faced. When some moral precepts and behavioral quasi-sides are out of alignment throughout the practice process, there is an ethical danger present. Engineering ethical risk refers specifically to the possibility that during the various stages of construction, operation, and management of engineering projects, the stakeholders involved may disregard ethical and moral constraints in order to maximize their interests, harming other pertinent interest subjects or the project itself. [4]

3. Engineering Ethical Risks in Big Date Applications

Engineering risks have three main characteristics: objectivity, universality and unpredictability. These three characteristics make risks always accompany with engineering activities. From the perspective of engineering ethics, big data technology has the following three main engineering ethical risks.

(1) Violation of individual privacy

The right to privacy has long been a contentious ethical issue, and in the age of big data, deeper data mining, more thorough data monitoring, and more thorough data prediction have sparked increasingly passionate public debates on the subject. The Chinese Academy of Sciences' Gan Shaoping Research Institute has stated that "with the widespread use of smart terminals in the digital society, the individual's basic right to privacy will be harmed in the process of transparency of the person's body and mind, and the loss of the individual's right to control information has already constituted a major threat to the core values of modern civilized society." [5]

With regard to the collection of personal information, the existing laws and regulations and related policies do not exactly set a limit on this, and some big data companies may utilize crawler technology to collect consumers' personal information, which includes personal electronic data information such as e-commerce platforms' shipping addresses, chat records of social software such as WeChat,

and search and browsing records of webpages and said new media. Some businesses may use a person's personal privacy information a Second or multiple times without getting that person's permission. This mode of data utilization is essentially the commoditization of personal information, laying the groundwork for the infringement of trafficking in personal privacy for economic gain.

The phenomenon of nuisance calls is one that the general public is most familiar with and where they are most likely to become aware that their personal information has been exposed. Technology-based solutions and the use of network technology to secure personal privacy for financial gain are at the heart of the nuisance call industry. There are two main types of technology, one is the use of technology products to identify cell phone numbers and make calls for telemarketing; the other is the use of cell phone software to collect users' personal information, such as name, ID card number, home address and other personal privacy data, and then sell it to other enterprises.

Additionally, when customers use the Internet to conduct information searches and download software, they provide a variety of data and information that is stored on the website. However, this personal data and information may be stolen by hackers or sold by the website operator, posing a threat to privacy security.

(2) Undermining social justice

Big data technologies are utilized with a wide disparity in subject rights. The rights enjoyed by those who have access to big data are very different from those who do not. This has led to the phenomenon of "data divide" and social injustice.

The development and application of big data technology relies on massive amounts of data, as well as the equipment and talent needed to analyze the data, something that ordinary people cannot do. Those who have big data and are able to use it gain more resources by analyzing the data and transforming the information into benefits. In contrast, ordinary people who use big data can only enjoy a small number of benefits, but they pay a greater price for it, that is, personal privacy is stolen and sold, which is obviously against the principle of fairness. The information dividend brought about by the Internet is inaccessible to individuals who lack the resources and expertise to use big data, leading to their progressive marginalization in the big data era. This disparity in access to information is gradually evolving into a disparity in material wealth, and as the importance of data grows, those who don't have the ability to handle big data or don't have access to big data may face more economic challenges, while those who have access to big data will be able to compete more easily in the marketplace. This will exacerbate the unequal allocation of social resources and have an impact on social justice by causing a more pronounced class divide and larger wealth disparity.

(3) Threat to public safety

While big data technology has changed the way human beings acquire knowledge and information, it has also threatened political security, economic security and cultural security to a great extent.

In terms of political security, the Internet has emerged as a new forum for political discussions, and complex information spreads quickly in the network world, evoking strong feelings in the public and influencing their perceptions of values, escalating disagreements between the two sides and broadening the scope of events; in terms of economic security, the rate of cybercrime in the financial system has been rising year by year, and economic security incidents like the St. If these economic occurrences are not highlighted and stopped, the national economy and even the state economy will suffer immeasurable damages; in terms of cultural security, big data has given cultural communication a more novel and rapid means of dissemination, but at the same time, it has also increased the hidden dangers of cultural security. Weibo, Zhihu, and Xiaohongshu are examples of new media platforms that offer clients precise information data. They also evaluate and predict user preferences using user search data in order to execute appropriate placement, making users "sticky" to big data. This reliance could encourage people to disregard their own judgment and critical thinking, allowing the public to be more easily affected by negative culture or opinions, affecting value judgments, and ultimately destroying our conventional ethical standards.

4. Causes of Ethical Risks in Big Data Technology Engineering

Analyzing the reasons for the current ethical risks of big data engineering is the Firstly step to effectively reduce engineering ethical risks and build a risk prevention system. The major causes of the existing engineering ethical concerns associated with big data technology are technicians' lack of understanding of their obligations in terms of engineering ethics, the flaws in the laws governing big data engineering ethics, and the inadequate risk assessment and oversight procedures.

(1) Lack of Awareness of Engineering Ethical Responsibilities of Big Data Engineering Subjects

The primary cause of the numerous engineering ethical dangers brought on by the use of big data technology is the absence of or inadequacy of big data engineers' and technicians' general engineering ethical awareness, which is mostly exhibited in the following aspects:

Firstly, big data developers do not consciously comply with the social moral code of conduct, and put corporate profits and competitive advantages Firstly when designing programs, thus omitting the potential negative impacts of the application of big data technology, failing to ensure the safety of big data in the application, and damaging the interests of users and society;

Secondly, big data engineers should work to protect public rights and social interests because they are the heart of engineering activities and a means of enhancing human well-being. However, in actual production activities, engineers fail to notify the appropriate authorities in time to stop the engineering activities and prevent the occurrence of engineering risks when they discover that their work may violate the public's right to privacy or endanger human safety;

Thirdly, when collecting, storing, and processing data, big data engineers neglected to completely take user data privacy and security into account. They directly acquired users' personal information for, and secretly observed users' behaviors. To lessen the possibility of engineering ethical risks, big data technologists should operate ethically within the bounds of their authority and cease making unethical decisions and engaging in unethical practices.

(2) Inadequate engineering ethics codes and laws and regulations for big data technologies

As a new form of technology, big data technology presents both opportunities and risks. Big data needs to be ethically constrained in order to play a constructive role, thus it's

important to strike a balance between innovation and risk. However, the current legal mechanisms and ethical norms to address the ethical issues of big data technology have yet to be improved.

The lack of engineering ethics rules and the application of the preexisting rules to bind them and forecast user behavior are the key factors contributing to the shortcomings of big data engineering ethics. The privacy of the data subject is violated by this unlawful gathering of personal information, which also goes against the idea of informed consent in engineering ethics. Secondly, big data technology users can control the personality and preferences of their users and use them as the foundation for predicting and locating user behavior in order to target service users thanks to the data mining, data analysis, information tracking, and user behavior prediction functions that big data technology exclusively enjoys. Because accurate preference pushing will increase the user's dependence on the intelligent system, making him or her go from not having to think to not wanting to think, and eventually becoming unable to think, this seemingly personalized service is actually unconsciously robbing people of their subjective position in social relations.

Big data engineering ethics also suffers from the problem of non-uniform ethical norms. There is no unified set of ethical norms within the big data industry for data capture, storage, correlation and analysis, so enterprises mostly set their own standards to determine the boundaries of personal privacy, information security and user rights. This kind of disorder without norms to follow will inevitably generate conflicts and ethical problems. Therefore, it is necessary to further revise and improve the engineering ethical guidelines in response to the new ethical challenges in the application of big data technology.

People can only shake their heads and sigh when they discover that big data violates personal privacy and nothing can be done about it, and the lagging of the relevant laws adds new resistance to solving the ethical issues of big data. This is because the unsynchronized development of the reality of the application of big data technology and theoretical research has made the existing laws no longer able to solve the new ethical issues arising from big data. In today's regulations, protecting internet privacy is merely a formality, according to Yan Wei, who also notes that "privacy protection principles such as 'purpose clarity, prior consent, and use restriction' are difficult to put into practice in the context of big data technology." [6]

(3) Inadequate Engineering Ethical Risk Assessment and Supervision Mechanisms for Big Data Applications

Although big data technology is evolving quickly, the related risk assessment and oversight mechanism is still lacking, particularly in the areas listed below.

Firstly, the enterprise's decision-makers lack access to engineering ethics risk assessment links. They are involved in all facets of engineering activities as decision-makers and managers of big data organizations, and as a result, they have a greater understanding of the possible dangers involved. They must therefore assume social responsibility by evaluating engineering ethical concerns and minimizing them;

Secondly, there is a lack of expert assessment of ethical risks in engineering. Evaluation experts are able to assess and supervise the engineering ethical risks more accurately according to their own professional knowledge, the corresponding theoretical principles and their own past experience, and they will understand the actual degree of engineering ethical risks more accurately;

Thirdly, the engineering ethical risk assessment does not involve enough of the general public. Considering that they are the ones who directly bear engineering risks, the government or businesses can somewhat benefit from their real requirements and opinions in order to prevent and manage engineering risks;

Fourthly, there is a lack of media oversight. In the age of big data on the Internet, the media sector can draw the attention of the appropriate departments by reporting on projects with significant risks and hidden dangers. These departments can then direct and supervise the engineering community to make decisions that will effectively ensure the project's safety.

5. Countermeasure Analysis of Ethical Risks in Big Data Technology Engineering

The use of big data technology carries some risk, but we shouldn't stop using it because of the risk. The solutions to the aforementioned engineering ethical risk problems resulting from the application of big data technology are now discussed. New technology inherently brings opportunities as well as challenges.

(1) Strengthening Big Data Engineers' Awareness of Engineering Ethical Responsibilities

To cultivate the awareness of engineering ethical responsibility among big data engineers and technicians, it is Firstly necessary for them to realize that big data, as a technical means to serve mankind, should not be used to seek other interests at the expense of the people's interests, but rather, public safety, health and well-being should be put in the Firstly place, and in this way, they should conscientiously protect the public's private data, consciously abide by the ethical code of conduct for the protection of personal privacy, the safeguarding of social justice, and take the initiative in assuming their own responsibility for the ethics of the society they are shouldering.

Secondly, engineering ethics training for relevant staff members needs to be strengthened. By regularly holding training sessions on engineering ethics, laws and regulations, industry norms, etc., in addition to case study instruction, you can help students understand the value of engineering ethics, the repercussions of acting unethically, and how to improve their moral sensitivity and sense of social responsibility. As a result, they will be able to make moral decisions like "should it be done or not" and "is it feasible?" By analyzing real engineering ethics cases, they can realize the importance of engineering ethics, understand the possible consequences of acting against ethics, improve their moral sensitivity and sense of social responsibility, and make them have basic moral judgment on "should it be done or not?

(2) Improving Engineering Ethical Principles for the Application of Big Data Technologies

Big data engineering ethics challenges are produced by big data technology, and it is required to establish and improve the related ethical standards in addition to boosting individual ethical awareness in order to successfully prevent and eliminate these problems.

Firstly, a principle focused on people. Not only is the focus on people the core of engineering ethical standards, but it is also the fundamental rule that engineers should follow when dealing with any ethical dilemmas related to their work. The

goal of engineering construction, as with all engineering construction, should be to improve people's living standards, quality of life, and protection of their safety as well as their individual and collective interests. Big data engineering construction should abide by this principle.

Secondly, the principles of fairness, equity and transparency. The data divide has been widened as a result of differences in the possession and use of data resources and the trafficking of data by commercial organizations for profit. the government should step up efforts to encourage data transparency, speed the development of big data talent, and foster a big data mindset among all citizens in order to prevent the data divide from getting any wider and to achieve justice in data use.

Thirdly, the principle of harmonization of rights and responsibilities and informed consent. We should take responsibility for any negative effects that big data technologies might have in addition to reaping its benefits. When employing big data technologies, we should insist on the equality of rights and obligations, make sure that the appropriate responsible parties are involved in the data collection, processing, and usage processes, and hold them accountable for their actions. Realize that whoever collects data is responsible for it, and whoever uses it is also responsible for it, in order to ensure data security. What's more, the data collectors' right to fully informed consent is strictly upheld. Before utilizing the data for analysis and prediction, data users must obtain the authorization of the individual from whom the data was gathered. They must also vigorously oppose data misappropriation, abuse, and other behaviors.

(3) Sound engineering ethics risk assessment and monitoring mechanisms for big data applications

Firstly, of all, improve the laws and regulations to solve the ethical problems of big data, and strengthen the supervision of the government. Existing laws can no longer solve the new ethical problems arising from the application of big data, so it is necessary to speed up the formulation and improvement of new laws and regulations to eliminate the legal gray area of big data ethics, and at the same time, strengthen the supervision of government agencies on big data activities, so as to effectively ensure the rights and interests of both data users and those who have been collected.

Then, create tight data management and accountability procedures next. To maintain the security of data use and lower the danger of information leakage, standardize authority management rules for data capture, storage, correlation, and analysis, as well as the operational behavior of key individuals.

Finally, improve the big data engineering community's ethical self-discipline and put in place a social supervision mechanism. Establish and improve the engineering ethics charter of the Thirdly-party regulatory body, the Ethics Committee, to evaluate internal ethical dilemmas within the industry, supervise the entire process of information activities, and assess the potential risks of engineering ethics. Establish a system of incentives and penalties to reward those who report violations and penalize staff who violate ethical norms.

6. Conclusion

Big data is being learnt and used by more and more industries and businesses as a new technology revolution in the modern world, considerably enhancing social production and altering the way information is retrieved. However, the deep mining and analyzing and predicting ability of big data technology has generated a series of new ethical issues. Big data technology applications should conform to the fundamental principle of human-centeredness, which is based on the preservation of social fairness and justice as well as the benefit of human productivity and existence, in order to successfully prevent and eliminate engineering ethical risk issues. Engineering stakeholders share responsibility when a danger occurs and raise the engineering community's awareness of engineering ethics and social responsibility.

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