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Scientific Morality in the Use of Technology as a Study of the Philosophy of Science on Ethics in the Digital Era

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Abstract: *The aim of this research is to study scientific morality in the use of technology in the digital era from the perspective of philosophy of science. In the philosophy of science, scientific morality seeks to ensure that technological and scientific developments are driven by ethical and logical considerations. Based on moral values, the use of scientific knowledge not only produces technical progress, but is also socially responsible, making better technology more beneficial to society. This research uses a qualitative approach with a literature study method. The main data source in this research is literature which includes books on the philosophy of science, scientific journals on digital ethics, articles related to scientific morality, as well as previous reports and research on technology in the digital era. Data collection was carried out through literature study, with data analysis using content analysis techniques. Artificial intelligence offers opportunities for progress, but also moral challenges, so developers, policymakers, and society need to collaborate to develop an ethical framework that ensures fair use of the technology and benefits society.*

PENDAHULUAN

In the digital era, technological advances have brought major changes to human life, such as communication and data-based decision making. Technologies such as the Internet of Things (IoT), big data, blockchain, and artificial intelligence (AI) have great potential to increase productivity and efficiency (Li, 2023). However, complex ethical issues arise with this technology, such as privacy violations, data manipulation, and unequal access to technology. In the philosophy of science, the concept of scientific morality is essential to understanding how technology can be developed and used ethically. Scientific morality, includes that scientists are responsible for using their research findings for the good and progress of humanity, not to cause harm (Miteu, 2024) .

Three main analytical frameworks fall within the discipline of philosophy of science known as scientific morality: ontology, epistemology, and axiology. Ontology investigates the reason for the existence of technology, and epistemology assesses the validity of the knowledge produced. Meanwhile, axiology focuses on the moral values that underlie the application of technology (Nitin Liladhar Rane, 2024). These three components are critical in the digital age where technology often

surpasses humans' ability to fully understand its effects. For example, crime prediction using AI can help public safety, but it can also lead to undetected discrimination and bias (Zuboff, The age of surveillance capitalism. In Social theory re-wired, 2023). This shows that the technology development cycle requires an ethical approach.

Phenomena such as deepfakes are one example of technology that raises moral issues in the modern era. This technology allows realistic audio and visual manipulation. It can be used for entertainment or training, but it can also damage a person's reputation and spread disinformation (Dan, 2021). The use of technology like this requires a thorough evaluation from the perspective of the philosophy of science. This method is in line with concept of the ethics of responsibility, which emphasizes the importance of considering how technology will impact humans and the environment in the long term. In the digital era, new ethical issues such as the use of algorithms that can increase social inequality and unauthorized data collection emerge (Kashif Ahmad, 2022). States that as advanced technologies advance, developers must ensure that the systems they create are not only ethical but also conform to moral principles. (Shneiderman, 2020)

The aim of this research is to study scientific morality in the use of technology in the digital era from the perspective of the philosophy of science, with special emphasis on how ethical principles can be applied in the development and application of technology. This study combines contemporary theories from the philosophy of science and digital ethics, and also investigates real cases to provide relevant recommendations for technology developers, academics, and policy makers. Therefore, this research increases our understanding of the role of morality in directing technology toward goals that benefit humanity.

METODE PENELITIAN

This research uses a qualitative approach with literature study methods to analyze scientific morality in the use of technology in the digital era from the perspective of philosophy of science. This approach was chosen because the research objective was to explore, understand and interpret philosophical thoughts and ethical theories related to the development of digital technology. This type of research is analytical descriptive research which aims to explain and analyze in depth the principles of scientific morality contained in the use of technology.

The main data source in this research is literature which includes books on the philosophy of science, scientific journals on digital ethics, articles related to scientific morality, as well as previous reports and research on technology in the digital era. Secondary data was obtained from relevant studies that focus on issues of scientific morality and ethics in technology. Data collection was carried out through library research, namely by collecting and reviewing various written sources that were relevant to the research theme. Searching for journal articles, books, policy reports and research results published in the last ten years will be the main focus.

The collected data was analyzed using content analysis techniques. In this technique, data found from the literature will be categorized based on main themes related to scientific morality, philosophy of science, and ethics of technology. Each category is analyzed to assess how the principles of scientific morality are applied to the use of technology and how the philosophy of science provides ethical guidance in this regard. To ensure the credibility and validity of the research, the author uses data from trusted and tested sources, such as leading international journals, books from experts in philosophy and digital ethics, as well as reports from credible institutions. The analysis was carried out with a critical and reflective approach to the relevance of existing theory and its practical application in technology in the digital era.

RESULTS AND DISCUSSION

Conceptual Foundations of Scientific Morality in the Philosophy of Science

Scientific morality refers to the moral principles that govern scientific endeavors, technological progress, and their social consequences. Scientific morality can be defined as a set of principles and rules that govern how scientists behave in research and the application of science. Scientific morality also includes research on the responsibilities of scientists in carrying out their work and the values that drive technological progress and research. Morality in science serves to remind that the development of science must pay attention to aspects of humanity and social responsibility. This shows that morality cannot be separated from scientific practice, where any scientific research must consider its effects on society (Asrulla, 2024).

Theories that support scientific understanding of morality come from the philosophy of science. There are three main foundations in the philosophy of science that relate to morality. The first is an ontology of scientific morality, which discusses how knowledge and technology relate to social and moral reality. The second is the ontology of the philosophy of science, which examines how scientific knowledge can affect the real world, including how it affects society and individuals. It is important to consider ethics when modern technologies such as big data and artificial intelligence (AI) impact the way people live. These technologies not only open up new opportunities, but also present ethical issues for decision making involving risk and uncertainty (Mulgan, 2016). Understanding what exists and how to understand the research subject morally. Emphasized that understanding reality is very important to develop meaningful and objective knowledge (Wahyudi, 2024).

In the context of ethics, the epistemology of scientific morality studies how scientific knowledge is obtained, validated, and applied. In scientific morality, epistemological studies emphasize that scientists must question the assumptions and values underlying their research, as well as how this will impact human life. According to scientific ethics, research and technological development must be transparent, and scientists must admit shortcomings and possible biases. In this regard, Zuboff (2019) points out that big technologies such as data mining and predictive analytics often have invisible biases that can exacerbate social and economic inequality. Therefore, scientific morality also functions as a tool for evaluating the truth and quality of scientific knowledge (Zuboff, 2023).

In the context of scientific morality, axiology focuses on the principles underlying the use of technology and knowledge. To use technology wisely in the modern era requires a deep understanding of moral principles such as justice, human rights and social welfare. Additionally, it includes issues such as privacy and individual freedom, which are increasingly relevant with technological developments such as Artificial Intelligence (AI) and the Internet of Things (IoT) (Floridi, 2013). Scientific morality faces new challenges in the current technological era, especially related to the misuse of technology and how it impacts social life. For example, the use of deepfake technology can damage a person's reputation and spread false information, which can create distrust in society (Mustak, 2023). Cases like this remind us of the importance of a strong code of ethics in technology development and the role of philosophy of science in guiding fair and responsible technology development. Because digital technologies have tremendous power to shape public opinion, developers and scientists must be responsible for the consequences they can have on social and cultural life.

Ethical Challenges of Using Technology in the Digital Era

Various aspects of human life have been changed significantly by advances in digital technology. However, these advances bring moral challenges for society, scientists, and technology developers. These ethical challenges include privacy, data security, unequal access to technology, and the possibility of misuse of technology for negative purposes. In situations like this, scientific morality plays an important role in determining the path towards just and responsible technological development, taking into account the impact it will have on society as a whole and on individuals themselves (Wolfe, 2023).

1. Privacy and Data Security Violations

   In the internet era, one of the major ethical issues faced is the violation of privacy. Everyone's personal data is often involved in the information collection process which can be misused thanks to advances in information and communication technology. Technologies such as the Internet of Things (IoT) and big data enable the collection of large amounts of data, which often involves personal data that individuals do not explicitly consent (Allhoff, 2018). For example, algorithms used to predict user behavior on digital platforms can endanger users' personal freedom and privacy (Hacker, 2023).

   This problem is exacerbated by the large number of cases of data leaks, which endanger the personal security and reputation of individuals. Therefore, technological advances in the digital era must be accompanied by strict ethical standards to guarantee the protection of individual privacy rights and clear and fair use of personal data. Data security should be considered an important part of ethical technology development (Dhirani, 2023).

2. Bias and Unfairness in Algorithms

   The existence of bias in algorithms used in automation and artificial intelligence (AI) systems is another important ethical issue. Artificial intelligence technology that is often used in decision-making processes, such as money lending, employee recruitment, or law enforcement, can cause social injustice if the algorithms used are not well designed (Yen, 2021). For example, research shows that facial recognition systems can exacerbate gender and racial biases because the algorithms used are often based on unrepresentative data (Johnson T. L., 2022).

   Further research suggests that unfairness in algorithms can persist because developers often do not consider the social impact of the technology they create, or fail to identify invisible biases (Richardson, 2021). Therefore, it is important to integrate ethical principles in algorithm design involving transparency, accountability, and fairness in AI-based decision making.

3. Misuse of Technology for Manipulation and Disinformation

   Advances in deepfake, virtual reality (VR), and augmented reality (AR) technology have made it easier to spread disinformation and manipulate data. Fake voice or video recordings that can easily be created have been used to damage a person's reputation or influence public opinion in an unmoral manner. Misuse of technology like this can disrupt democracy, such as disrupting elections by spreading misinformation or slandering people (Johnson J. , 2023).

   The spread of disinformation on digital platforms can undermine public trust in the media, institutions and democratic processes. Therefore, policies and regulations are needed to overcome this problem, as well as the development of technology that is fairer and more transparent. Digital education that teaches people to assess and verify data on the internet is also increasingly important.

4. Technology Access Gaps

In addition, disparities in technology access between various groups in society based on geography, economics, and society are a significant ethical issue. Large portions of the population in many developing countries still do not have adequate access to digital technology, leading to inequalities in access to education, employment and health services. As a result, social and economic inequality is increasing, and injustice is emerging throughout the world (Chancel, 2020)

Additionally, these inequalities lead to a "digital divide," where those with access to technology gain greater benefits, while those left behind remain in poverty and information-limited. To address this gap, global efforts and public policies aimed at reducing this gap are needed.

5. Responsibilities of Technology Developers and Users

The responsibilities of technology developers and users are also an ethical issue. Technology developers and scientists must think about the social impact of their products and ensure that technology is used in good and not bad ways (Van de Poel, 2023). Likewise, people who use technology must understand the responsibilities and limitations of the technology. For example, when they use social media, they should consider how their actions be they posts, comments, or sharing information have an impact.

Artificial Intelligence and Scientific Morality

Bringing many advances that change the way we interact with each other, artificial intelligence (AI) has become one of the greatest technological innovations in history. However, the issues of scientific morality and ethics that must be considered when developing AI raise questions. In this context, it is important to explore how AI interacts with moral values and social responsibility.

1. Ethics in Artificial Intelligence Development

Bringing many advances that change the way we interact with each other, artificial intelligence (AI) has become one of the greatest technological innovations in history. However, the issues of scientific morality and ethics that must be considered when developing AI raise questions. In this context, it is important to explore how AI interacts with moral values and social responsibility.

Developing AI requires both moral and technical considerations. As explained in the article by Dikaafladhia (2023), questions such as whether AI should have the ability to differentiate between right and wrong and who is responsible for decisions made by AI are very relevant to think about philosophically.

2. AI Conscience and Morality

Whether AI can have morality is a key issue. States that current AI cannot feel or understand morality like humans because it relies on data and algorithms and does not have consciousness or emotions. As a result, the decisions taken by AI are not based on moral considerations. This raises the problem of ensuring that decisions made by AI systems comply with social ethics (Hagendorff, 2020).

3. Moral Responsibility in Using AI

Moral responsibility for the use of AI lies with humans. Adriyansa et al. (2024) found that although these technologies can make their own decisions, developers and users are still responsible for those decisions. This suggests that a clear ethical framework is needed to guide the development and utilization of this technology (Bankins, 2021).

4. Challenges in Managing AI Morality

   As technology develops, the issue of AI morality becomes more complex. Analysis conducted emphasizes the possibility that human decision making may rely entirely on algorithms that may not take human values into account. Therefore, to ensure that the use of AI does not come at the expense of humanity, it is important to develop clear moral standards (Gabriel, 2020).

5. Openness and Transparency in AI Development

   To face ethical challenges related to AI, openness and transparency are key. Developers must explain how AI systems make decisions so that users can understand the process. This also means that various stakeholders must work together to ensure that moral values are incorporated into the design and implementation of AI systems.

Public Policy and Scientific Morality in Digital Technology

In the digital era, technological advances influence public policy and scientific morality. In light of the increasingly widespread use of technology, morality and ethics must become important components of effective public policy. The relationship between public policy and scientific morality in the digital era will be discussed in this article, as well as the problems and solutions faced. Public policy helps make decisions that impact society at large. This policy must be able to adapt to technological changes in the digital era. Said that morality must be a concern for law enforcement and public policy. This is especially true for the protection of personal data and the prevention of cyber breaches. This shows that policies must consider human as well as technical values (Hughes-Lartey, 2021).

How scientists and technology developers should behave morally when they create products that benefit society. Emphasize that the use of technology must be done with awareness of its ethical consequences (Huda, 2019). Technology ethics, or technoethics, has become important to ensure that every innovation not only meets technical requirements but also considers its moral consequences for people and society. Dealing with ethical dilemmas that arise from technological developments is one of the main challenges in developing public policy in the digital era. These dilemmas include privacy, data security, and possible misuse of the technology. Found that a lack of ethical awareness can lead to poor morals in society, especially among the younger generation who are more easily affected by the negative impacts of technology.

Individual rights must be protected and the use of technology must be strictly regulated. Law reflects society's moral values and functions as a set of formal rules. Therefore, it is vital for policymakers to ensure that the regulations implemented are not only technically efficient but also fair and morally appropriate. Several actions can be taken to address the challenges faced in public policy related to digital technologies: 1) Ethical Guidelines: Creating clear ethical guidelines for the development and use of technology; 2) Public Education: Increase public awareness about the importance of ethics in the use of technology; 3) Multidisciplinary Collaboration: Encourages cooperation between scientists, policymakers, and civil society to create policy; 4) Continuous Evaluation: Policies are evaluated periodically to ensure they remain relevant with technological advances.

CONCLUSION

In the philosophy of science, scientific morality is an idea that seeks to ensure that technology and science develop through ethical and logical considerations. The use of scientific knowledge based on moral values will produce progress that is not only technically beneficial, but also socially

responsible. Scientific morality is the key to ensuring that better technology becomes better. In the digital era, there are many ethical issues related to the use of technology. This is not only related to technological advances themselves, but also how technology can be applied in everyday life. Therefore, it is vital that ethical principles are incorporated into every phase of the technology life cycle, from design to use, as well as in the creation of policies that enable the fair and responsible use of technology. During technological development, scientists, developers, and policymakers must stand on scientific principles to ensure that such advances will only bring benefits to humans and not bring irreparable harm.

Although artificial intelligence offers many opportunities for technological advancement, it also brings significant challenges from a moral perspective. We can ensure that the use of AI is ethical and in line with human values if we consider aspects of scientific morality when developing and using it. It is critical for developers, policymakers, and society to speak openly to create a strong ethical framework for the future advancement of artificial intelligence. In the world of digital technology, public policy and scientific morality are intertwined. It is important to create policies that consider values and ethics to ensure technological advances benefit society. We can create a safer and more responsible digital environment with the right methods.

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