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# AI Ethics for 6G: Governance, Global Alignment, and Responsible Innovation

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**Abstract**: Sixth-generation (6G) communication technologies represent not only a technical revolution but also a governance transformation in which artificial intelligence (AI) systems are deeply integrated into network infrastructures. This paper analyzes AI ethics in the 6G era through a multidisciplinary lens, focusing on governance architectures, global policy alignment, and the interplay between ethical principles and innovation. It presents a comparative analysis of the United States, the European Union, and China's approaches to AI governance, discusses the feasibility of a universal ethical framework amid normative and geopolitical challenges, and highlights the role of ethics as a driver—not merely a constraint—for innovation. By exploring frameworks like SMACTR, the study proposes a balanced integration of regulation, innovation, and normative values. Ethical AI governance is positioned not only as a matter of technical safety but also as a foundation for sustainable digital development.

**Keyword:** AI ethics, 6G technologies, Federal regulations, Global Policy Alignment

**JEL Classification**: F53, O33

## 1. Introduction

Sixth-generation (6G) communication technologies not only offer higher speeds and ultra-low latency but also represent a paradigm in which artificial intelligence (AI) is deeply integrated into network infrastructures (Cui et al., 2025). This transformation evolves communication systems into an "AI-native" structure, rendering critical processes such as decision-making, resource allocation, and quality-of-service optimization largely autonomous (Wang et al., 2023). However, this technological leap is not limited to engineering solutions alone; it also brings profound ethical, social, and political responsibilities (Cheong, 2024; Radanliev, 2025).

In the context of AI's ethical governance, the literature widely acknowledges four fundamental principles: transparency, accountability, fairness, and privacy (Radanliev et al., 2025). These principles provide a normative framework that ensures both the safety of the technology and its

societal legitimacy. Yet, the interpretation and implementation of these principles vary significantly depending on countries' policy architectures and regulatory cultures (Chun, Schroeder de Witt, & Elkins, 2024). While the European Union adopts a preventive and rights-based approach through regulations such as the AI Act and GDPR, the United States prefers a more flexible, sector-based, and market-oriented framework (NTIA, 2024). China, on the other hand, builds a centralized governance model focusing on data sovereignty and national security (Leiden Asia Centre, 2022). These regional differences constitute one of the major obstacles to achieving global ethical harmonization and standardization. Although organizations such as the ITU, OECD, and IEEE attempt to develop universal ethical frameworks, cultural norm divergences and geopolitical conflicts of interest limit these efforts. UNESCO's 2021 "Recommendation on the Ethics of Artificial Intelligence" is the first comprehensive and binding ethical framework that establishes global governance principles addressing AI's potential risks in areas such as human rights, the environment, transparency, and social justice.

This document emphasizes fundamental principles such as proportionality, transparency, accountability, data privacy, human oversight, and the prohibition of discrimination, while also explicitly banning practices such as social scoring and mass surveillance, making it the first international standard text of its kind (UNESCO, 2021). Nevertheless, an increasing number of recent studies suggest that ethical principles can serve not only as constraints but also as mechanisms that facilitate innovation (SNS Technology Board, 2025). For telecommunications operators, AI systems must not only be technically but also ethically reliable; at the same time, they should be approached with a functional and adaptive mindset that encourages innovation. Ericsson proposes implementing this approach through a "combined methodology," whereby guidance, testing processes, and software solutions are integrated to ensure that AI systems are both legally compliant and open to innovation (Ericsson, 2022).

This study aims to analyze, in a multidimensional manner, the governance architectures of AI ethics in the 6G era, global policy alignment, and the innovative potential of ethical principles. Accordingly, it will:

(1) conduct a comparative analysis of the ethical policy approaches of the US, EU, and China;
(2) examine whether a universal ethical framework is possible; and
(3) assess the contributions of ethical design principles to 6G innovation.

Thus, the study will present an original framework that examines the interaction of technology, policy, and ethics from an interdisciplinary perspective.

## 2. Methodology

This study is a qualitative research that examines the governance, normative, and innovative dimensions of AI ethics within the context of 6G communication technologies through a conceptual framework. Methodologically, a combination of comparative analysis and conceptual synthesis approaches was employed; the AI ethical governance policies of the United States, the European Union, and China were comparatively evaluated based on current regulatory documents, normative principles, and sectoral practices. As part of the literature review, academic studies published between 2018 and 2025, international organization reports (IEEE, UNESCO, OECD, ITU), and policy documents (AI Act, AI RMF, AI Ethics Guidelines) were examined. The theoretical foundations for the analysis included Floridi and Cowls' ethical principles framework, Jobin et al.'s global ethical consensus analysis, and Raji et al.'s SMACTR internal auditing model. The purpose of the study is not limited to explaining existing governance structures, but also to proposing a holistic balance between ethics, innovation, and regulation. The validity of the findings is based on the comparative analysis of representative examples and the consistent application of the theoretical framework.

## 3. Conceptual Foundations – Reflections of AI Ethics in Telecommunications

The increasing use of artificial intelligence systems in the telecommunications sector brings ethical principles such as data privacy, transparency, security, and accountability directly into focus. In this context, next-generation distributed learning approaches such as Federated Learning (FL) offer significant opportunities for safeguarding privacy by ensuring that user data remains on the device. FL enables local updates of models without sending user data to centralized servers, thereby developing an infrastructure more compliant with strict regulations such as the GDPR. This makes it possible to manage ethical and legal obligations in harmony. However, attack types such as model poisoning create new areas of ethical responsibility for the security of FL architectures (Liu et al., 2025). In this context, the integration of AI into communication networks is no longer solely an engineering-focused discussion but has become a multidisciplinary area of responsibility shaped by normative principles (Cheong, 2024).

In the AI ethics literature, four fundamental principles are generally recognized: transparency, accountability, fairness, and privacy (Radanliev, 2025). These principles provide a conceptual framework that ensures the reliability of systems, their societal acceptance, and compliance with regulations.

Transparency involves the explainability and traceability of algorithmic decision-making processes. Explainable AI (XAI) approaches strengthen trust relationships by enabling users to understand how the system operates (Guidotti et al., 2018). In the telecommunications sector, transparency in critical areas such as network prediction, spectrum sharing, and traffic management is directly related to network security (Ericsson, 2022).

Accountability refers to the necessity of determining who will be legally and institutionally responsible for the outcomes resulting from algorithmic errors or biases. As systems with autonomous decision-making capabilities become widespread in 6G infrastructures, the implementation of the "accountability-by-design" principle provides a preventive structure that protects users from harm (NTIA, 2024).

Fairness is of great importance in ensuring that algorithms do not discriminate and that all user groups have equal access and services. Particularly, biases that may arise during data training can reproduce structural inequalities in critical communication services (Batool et al., 2023). The inclusive digital transformation goal of 6G can only be achieved if this principle is integrated at both the policy and engineering levels.

Privacy requires the protection of individual data and the transparency and security of systems' data processing procedures. Methods such as federated learning make this principle technically feasible by enabling local modeling without centralized data collection (Liu et al., 2020).
These fundamental principles not only ensure the ethical compliance of technical systems but also make it possible for innovation to meet societal trust.

## 4. Regional Governance Architectures – United States, European Union, and China

How artificial intelligence (AI) ethics is governed in the context of 6G technologies is shaped not only by the technical infrastructures of countries but also by their regulatory approaches, perspectives on data sovereignty, and the dynamics of public-private sector collaboration. This section comparatively examines three different governance models, demonstrating how ethical principles are addressed institutionally in the United States, the European Union, and the People's Republic of China.

### 4.1. United States: Market-Oriented and Sector-Based Governance

In AI governance, the United States prefers a "soft governance" approach instead of centralized regulations. This model prioritizes sectoral autonomy, relies on market dynamics, and is based on

voluntary standards and guiding documents. While this structure preserves the innovation freedom of technology companies, it places ethical responsibility on internal corporate mechanisms. Risks associated with AI systems must be addressed not only technically but also socially, ethically, and institutionally; these risks can have both short- and long-term effects on individuals, societies, and the environment, depending on the context of system use. According to NIST, AI risk management is defined as a combination of the magnitude of a system's potential harm and the likelihood of its occurrence; this approach aims to reduce expected negative impacts while enhancing positive ones (NIST, 2023).

In this context, the Federal Communications Commission (FCC) in the United States has, for the first time, proposed specific rules regarding AI-enabled robocalls and robotexts, taking proactive steps to prevent the misuse of AI applications and protect consumer rights. This approach by the FCC seeks to strike a balance between legal regulation and market-oriented governance and aims to mitigate AI-related risks, particularly in sensitive areas such as election security (Federal Communications Commission [FCC], 2024).

### 4.2. European Union: Preventive, Rights-Based, and Normative Governance

The European Union has one of the most systematic and normative architectures in the world regarding AI ethics. Regulations such as the General Data Protection Regulation (GDPR) and the Artificial Intelligence Act (AI Act) have established a rights-based approach that governs not only technical applications but also their societal impacts (European Commission, 2021).

The EU's approach introduces strict regulations for high-risk AI applications through a risk-based classification system, while aiming to maintain flexibility for low-risk systems. Telecommunications systems generally fall into the high-risk category in this context, making the principles of transparency and accountability legally mandatory (European Commission, 2024; TM Forum Inform, 2024). Additionally, the AI Act contains explicit provisions for the testing, auditing, and explainability of algorithms. This form of governance offers an ethics-centered design philosophy that places individual rights ahead of institutional efficiency.

Accordingly, the European Union's AI Act legislation classifies AI applications, particularly those in the telecommunications sector, as "high risk." Within this scope, systems used in telecommunications—especially in critical infrastructure and communication services—are considered part of the high-risk group and are subject to mandatory requirements such as transparency, human oversight, data quality, and security.

### 4.3. People's Republic of China: Centralized, Security-Oriented, and State-Controlled Governance

China's approach to AI ethics differs significantly from the other two regions. Shaped by the principles of centralized state control, data sovereignty, national security, and political stability, the Chinese model regards ethical governance as equivalent to the security of technical systems (Leiden Asia Centre, 2022).

The "AI Ethics Governance Guidelines" published in 2022 emphasize system design based on public interest, harmony, and socialist values. However, these principles are not individual-rights-based ethical principles in the Western sense but are instead rooted in collective stability and state authority. In China's telecommunications industry, AI systems are largely designed in alignment with state-controlled institutions and security policies, which in turn legitimizes surveillance-based systems from an ethical standpoint (Zeng et al., 2022).

These three governance models are influential not only at the national level but also in shaping global ethical standards. In the context of strategic technologies such as 6G, these differences directly impact not only technical architectures but also individuals' digital rights and data security. Therefore, it is critically important to develop a multi-layered governance approach that considers cultural and normative differences as much as international collaboration.

## 5. Global Policy Alignment Potential

The global impact of artificial intelligence (AI) applications necessitates not only technical integration but also the harmonization of ethical values at an international level. As highly impactful technologies like 6G create borderless infrastructures and decision-making mechanisms, ensuring effective ethical governance not only at the local or regional level but also on a global scale has become a strategic necessity. The IEEE's global standards development process, which is based on the principles of participation, transparency, and balance, provides a foundation aligned with universal values such as AI ethics (IEEE, 2023).

At this point, a fundamental question arises: Is a universal AI ethical framework possible?

### 5.1. Normative Challenges: Cultural Values, Political Systems, and Ethical Perspectives

Because AI ethics is fundamentally a value-driven field, cultural and political differences are among the most significant factors limiting global alignment. For example, while ethical frameworks in the West are built on liberal values such as individual rights, autonomy, and transparency,

countries like China prioritize public interest, collective stability, and state oversight (Floridi, 2021; Leiden Asia Centre, 2022). This makes it difficult to reach consensus on ethical principles, and even if a universal text is created, its implementation mechanisms vary from country to country. In establishing universal ethical frameworks, principle-based and open governance structures developed by institutions such as IEEE can generate models that serve as bridges between national regulations (IEEE, 2023).

### 5.2. Strategic Barriers: Data Sovereignty and Economic Competition

Other factors that make global ethical alignment more of a geopolitical issue than a technical one include data sovereignty, economic conflicts of interest, and competition in setting digital standards. For instance, China has made strategic moves to impose its own technical standards on the global market, while the EU has aimed more at normative leadership (Leiden Asia Centre, 2022; European Commission, 2022). The United States, on the other hand, produces indirect global influence by establishing de facto standards through technology companies with strong market power (NIST, 2023).

In this context, building a universal ethical framework requires not only consensus on principles but also the establishment of multilateral collaborative structures in implementation and enforcement mechanisms.

### 5.3. Roadmaps: UNESCO, OECD, and ITU Initiatives

The Europa Directory of International Organizations (2022), which analyzes the functioning of international organizations, highlights that multilateral governance mechanisms provide a fundamental structure for the universal adoption of ethical standards. In particular, the principles of transparency, inclusiveness, and representation in the standard-setting processes of organizations such as UNESCO, OECD, and ITU give these organizations the capacity to build bridges between different cultural and political systems. However, the success of these efforts depends not only on the creation of normative texts but also on shaping implementation and enforcement mechanisms through multilateral consensus. In this regard, the multilateral cooperation models described in the Europa Directory provide institution-level inspirational examples for global AI ethics governance.

Encouraging developments also exist in this context. Notably, UNESCO's 2021 Recommendation on the Ethics of Artificial Intelligence has, for the first time, outlined the framework for a global ethical structure by presenting a set of guiding but non-binding norms for states. Similarly, the

OECD AI Principles and ITU's "AI for Good" initiatives form the basis for globally oriented collaborations focusing on both ethics and sustainability (OECD, 2025).

However, most of these texts are still based on voluntarism, and their enforcement mechanisms are limited. This brings with it the risk of the concept of "universal ethics" remaining only on paper. Therefore, international regulatory systems and standardization bodies need to develop more binding mechanisms.

## 6. The Balance Between Ethics, Regulation, and Innovation

One of the most critical questions in the governance of rapidly evolving technologies such as artificial intelligence (AI) and 6G is whether ethical principles serve as a barrier to innovation or as an enabler. This debate is not merely a theoretical ethical issue; it has become a pragmatic, strategy-shaping concern for policymakers, the private sector, and research communities alike. Establishing a healthy balance between ethical principles, regulations, and innovation in the field of AI is becoming increasingly crucial. The framework proposed by Floridi and Cowls, which is based on five core principles, provides a guiding structure for achieving this balance.

The principle of beneficence emphasizes that innovation should consider the well-being of humanity and the planet. The principle of non-maleficence stipulates that regulations should prevent risks related to privacy, security, and misuse. The principles of autonomy and justice encourage system designs that safeguard individuals' decision-making power and promote social equality. The principle of explicability ensures that algorithmic processes are transparent and accountable, thereby forming the basis for legal oversight. This ethical framework is positioned as a guide that directs innovation without hindering it. Achieving an effective balance is a shared responsibility not only of lawmakers but also of technology developers and society at large (Floridi & Cowls, 2019).

### 6.1. Ethics and Regulation

The rise of AI technology represents not only a technical transformation but also a normative and governance-related inflection point. Particularly in recent years, the "AI leadership" race between states and major technology companies has created a complex relationship with regulatory processes tied to ethical principles. Cave and ÓhÉigeartaigh (2018) analyze this phenomenon through the concept of the "technological superiority race narrative," systematically revealing how competitive rhetoric can erode ethical governance.

In this context, the conflict between technological advancement and ethics is not merely a matter of regulatory delay. The real danger lies in narratives such as "first-mover advantage" or "winner-takes-all," which exert pressure to the extent that they can bypass regulatory processes altogether. Such rhetoric can replace multi-stakeholder and inclusive governance processes with narrow security-driven paradigms obsessed with speed and superiority (Cave & ÓhÉigeartaigh, 2018).
This issue becomes even more critical when it comes to highly impactful technological infrastructures such as 6G. In these systems, AI penetrates safety-critical areas such as network management, resource allocation, and decision-making, thereby interacting directly with ethical parameters such as decision-making transparency, user privacy, and algorithmic neutrality. If the race for technological superiority undermines security measures and oversight mechanisms, the systematic occurrence of ethical violations becomes inevitable.

## 6.2. Can Ethics Be a Competitive Advantage?

On the other hand, an increasing number of studies suggest that ethical governance does not conflict with innovation; rather, it can be a supporting factor. Transparent, fair, and accountable systems developed within the framework of corporate responsibility not only ensure regulatory compliance but also provide companies with advantages in terms of user trust, market reputation, and data quality (Jobin et al., 2019).

Indeed, a comprehensive analysis conducted by Jobin, Ienca, and Vayena (2019), which reviewed 84 ethical guidelines published worldwide, demonstrates the emergence of a global normative consensus on AI. This consensus, shaped around the principles of transparency, fairness, non-maleficence, responsibility, and privacy, is viewed not only as an ethical foundation but also as an element that enhances reputation, builds trust, and facilitates market access for companies and countries.

However, the same study also highlights significant differences in how these principles are interpreted and implemented. This underlines the importance of integrating ethical principles into corporate strategies not only symbolically but also operationally. Organizations capable of translating ethical principles into action not only protect themselves from risks but also gain competitive advantages in terms of technological inclusiveness, sustainability, and long-term user loyalty.

As noted in the study by Fjeld et al. (2020), ethical principle documents are adopted by the private sector not only to establish internal policies but also to build user trust, strengthen relationships with regulatory authorities, and enhance corporate reputation. This enables organizations that place AI ethics at the core of their corporate strategies to achieve competitive superiority in the

long term. Moreover, multi-stakeholder documents and government-issued strategy papers demonstrate that ethical governance functions not only as a tool for local alignment but also for establishing global norms and coherence. Thus, ethical AI not only ensures regulatory compliance but also becomes one of the fundamental building blocks of a sustainable technology policy for both organizations and states through reliability, transparency, and responsible innovation.

### 6.3. A New Balance Framework: Regulation + Innovation + Normative Values

The new approach proposed in this section positions ethical governance not as a barrier to innovation but rather as a cornerstone that guides responsible and sustainable technology development processes. Raji et al. (2020) argue that integrating internal auditing processes based on ethical principles into the AI system development lifecycle ensures that innovation is shaped in harmony with governance while prioritizing societal benefit.

In this framework:

- Regulations establish minimum ethical and legal compliance thresholds, ensuring systemic safety.
- Innovation evolves into a creative potential that is ethically guided within these boundaries.
- Normative values (e.g., justice, accountability, privacy, and non-maleficence) are placed not only at the heart of external audits but also at the core of product design and engineering decisions.

The internal auditing framework known as SMACTR implements the "ethics by design" approach, which directly incorporates ethical principles into innovation processes, as well as the "accountability by default" approach, which provides systematic transparency and accountability mechanisms across the organization. This allows ethical principles to be positioned as a strategic component of R&D processes, extending beyond mere legal obligations (Mert et al, 2024).

As a result, this integrated structure enables internal ethical audits to serve as both a guiding mechanism during the design phase and a tool that ensures accountability to external stakeholders (Raji et al., 2020).

## 7. Conclusion and Policy Recommendations

In the new era where artificial intelligence (AI) is integrated with highly impactful technologies such as 6G, ethical governance is no longer a choice but a political and strategic necessity. The three core dimensions addressed in this study—governance structures, global policy alignment, and the relationship between ethics and innovation—clearly demonstrate that ethical principles are not

merely a theoretical set of norms; they are also an active policy instrument situated at the center of technological design, regulation, and economic competition.

However, the construction of a globally valid, binding, and functional ethical framework still faces numerous challenges. Among these are cultural value differences, normative understanding conflicts, data sovereignty policies, and competition in technological standards.

In this context, the following strategic policy recommendations can contribute to building ethical AI governance on more inclusive, sustainable, and innovation-driven foundations:

*Policy Recommendations could be listed as:*

1. Multi-Layered Governance Structure: A multi-layered governance architecture that functions in harmony at national, regional, and global levels should be established. This structure must synchronously encompass both technical standards and ethical principles.
2. Reframing Ethical Regulations as "Innovation Catalysts": Ethics should be viewed not only as a risk-reducing filter but also as an "innovation catalyst" that provides user trust and social license.
3. Common Ethical Glossary and Core Principles Set: A shared set of values and definitional framework capable of bridging different cultural approaches should be developed. This can be based on the work of organizations such as UNESCO and the OECD.
4. Sectoral Ethical Sandboxing and Pilot Applications: In high-risk sectors, especially telecommunications, regulated experimental environments (sandboxes) should be established to test ethical principles and balance them with innovation.
5. Funding and Regulatory Models that Encourage Ethical Design: Public policies should be supported not only with compliance obligations but also with tax incentives, R&D grants, and certification systems that encourage ethical design.

Building a universal AI ethical framework is, in the short term, more of a political challenge than a technical one. However, this goal is not unattainable if it is approached through shared values, flexible configurations, and multilateral diplomacy. Technologies such as 6G, which have a global sphere of influence, present both risks and opportunities to realize this vision.

Therefore, this study is not merely a comparison or analysis; it is also a call to align ethical governance with innovation. For political actors, the academic community, and the private sector to take this call seriously will shape not only the technological future but also the foundation of a humane and just digital order.

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