



Legal Protection Against Child Sexual Exploitation Through Augmented Reality and Virtual Reality Technology

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Abstract. *This research examines legal protection against child sexual exploitation through Augmented Reality (AR) and Virtual Reality (VR) technologies, which are increasingly developing in the digital era. AR combines virtual elements with the real world, while VR creates a fully immersive environment. Both offer positive opportunities and serious risks, including new crime modes such as the creation of avatars or virtual models of children for sexual purposes, grooming in virtual spaces, and the distribution of immersive child pornography. Anonymity, the difficulty of age verification, the lack of digital literacy, and the forensic challenges of 3D content are significant obstacles to law enforcement. Existing regulations, including Law No. 17 of 2016 concerning Child Protection, Law No. 1 of 2024 concerning the Second Amendment to the ITE Law, and Law No. 12 of 2022 concerning the TPKS, have provided a strong legal basis, but do not specifically regulate AR/VR technology. A normative juridical research method with a statutory and conceptual approach is used to analyze existing norms, regulatory gaps, and their relevance to international standards such as the Budapest Convention and the Lanzarote Convention. The research findings emphasize the urgency of adaptive regulatory updates to technological developments, the implementation of cybersecurity standards, mandatory age verification, and strengthening the capacity of law enforcement officers in digital investigations and AR/VR forensics. Cross-border and cross-sector collaboration is needed to expedite notice and takedown mechanisms and close legal loopholes exploited by perpetrators. These efforts are expected to create a safe digital environment for children and increase the effectiveness of legal protection in the realm of immersive technology.*

Keywords: *Augmented Reality; Child Sexual Exploitation; Cybersecurity; Legal Protection; Virtual Reality.*

1. INTRODUCTION

The development of Augmented Reality (AR) and Virtual Reality (VR) technologies has brought about major changes in how humans interact in the digital world (Pramesti, 2023). AR blends virtual elements with the real world, while VR creates a fully immersive environment that places users in an artificial world (Christianingrum, 2024). These changes have not only impacted the entertainment, education, and business sectors but also pose serious legal challenges, particularly regarding child protection. Realistic virtual environments can be exploited by criminals for inappropriate interactions, including the sexual exploitation of children (Nur, 2025). This demonstrates that technological advances can be a double-edged sword, bringing both significant benefits and risks (Segara, 2025).

The emergence of new modes of child sexual exploitation based on immersive technology poses a real threat in the digital era (Adiarti, 2025). Perpetrators can manipulate child avatars or create sexual content based on virtual models that appear highly realistic (Nirmala, 2025). Interactions in AR and VR often occur in private digital spaces, making them difficult to monitor by third parties or law enforcement (Kadir, 2025). This method has developed with the increasing use of immersive devices, which are now more affordable and

accessible. User anonymity further increases the opportunity for crimes without rapid identification (Laksana, 2023).

The urgency of legal protection against this phenomenon is based on the nature of AR and VR technology, which transcends geographical boundaries and requires minimal direct supervision. Child sexual exploitation on these platforms can occur even if the perpetrator and victim are in different countries (Krisnamurti, 2024). It makes it difficult for law enforcement to take swift action because it involves international jurisdiction. The challenge requires regulatory updates and coordination between countries to ensure perpetrators can be effectively prosecuted. The complexity of the technology also requires the involvement of digital forensics experts to ensure sufficient evidence of the crime.

Recent statistics and trends indicate a significant increase in cases of child sexual exploitation based on digital platforms. Reports from various child protection agencies indicate a surge in complaints related to child pornography and grooming practices in virtual spaces (Hukom, 2025). This data serves as evidence that cyberspace is no longer a safe space for children without adequate supervision and regulation (Hutagalung, 2024). The rapid pace of technological development often means that existing regulations are outdated, allowing perpetrators to exploit legal loopholes. This situation demands serious attention from policymakers to update relevant legal instruments (Marzuki, 2025).

Conceptually, legal protection is divided into two types: preventive and repressive. Preventive protection aims to prevent violations by building legal awareness, establishing technological security standards, and enforcing age verification (Siswanto, 2024). Repressive protection focuses on prosecuting violations that have already occurred through criminal law, including imposing strict sanctions on perpetrators (Irawati, 2024). These two forms of protection complement each other in creating a safe digital environment for children. Child protection theory, from a legal perspective, emphasizes the importance of clear regulations; from a sociological perspective, the role of society, and from a philosophical perspective, it emphasizes universal human values (Natsir, 2024).

The definition and scope of child sexual exploitation are explicitly regulated in Law Number 17 of 2016, which amends Law Number 23 of 2002 concerning Child Protection. This law prohibits all forms of sexual violence against children, including those perpetrated through electronic media (Andayani, 2022). Its scope includes the use of children for sexual purposes, the creation or distribution of child pornography, and grooming (Soraya, 2023). International standards such as the UN Optional Protocol on Child Trafficking, Child Prostitution, and Child Pornography provide a global reference that aligns with the principles of child protection in

Indonesia (Harefa, 2024). Implementing this clear definition is crucial to avoiding multiple interpretations in law enforcement.

The immersive nature of AR and VR technologies makes them vulnerable to abuse. AR allows the merging of virtual objects with the real world, while VR creates a full-fledged simulation that makes interactions feel real (Mirza, 2024). These features can be used for positive purposes, such as interactive learning, but they also have the potential to be misused by perpetrators to create virtual sexual experiences involving children. The risk is heightened because interactions in virtual spaces are difficult for third parties to directly monitor. The speed of development of these technologies often outstrips the readiness of existing regulations.

The differences between AR and VR also influence the forms of abuse. In AR, perpetrators can manipulate real-life images or videos of children by adding sexualized visual elements. In VR, perpetrators can create complete simulations depicting children in sexually exploitative scenarios. Both technologies utilize realism to enhance the appeal of content, increasing the risk of spreading illegal content (Dewi, 2025). The potential psychological impact on victims is also very high, even though interactions occur in virtual worlds. This requires regulations to address this new and complex form of crime.

The legal framework in Indonesia already provides several important instruments to address this issue. Law Number 17 of 2016 regulates general child protection, including criminal sanctions for perpetrators of sexual violence against children. Law Number 1 of 2024, the second amendment to the Electronic Information and Transactions Law, prohibits the distribution of content that violates morality on electronic media. Law Number 12 of 2022 concerning Criminal Acts of Sexual Violence expands the scope of criminal acts, including those committed through information technology. Government Regulation Number 71 of 2019 concerning the Implementation of Electronic Systems and Transactions regulates the obligations of electronic system operators to protect user data and security.

The implementation of this legal framework still faces significant challenges. One of the biggest obstacles is proving cases involving immersive technology, as it requires specialized digital forensic expertise. International jurisdiction presents a barrier when the perpetrator or server is located outside of Indonesian jurisdiction. The preparedness and technical capacity of law enforcement officers are crucial factors in successful enforcement. Inter-agency coordination and international cooperation are essential to overcome these obstacles. Adaptive regulations to technological developments will determine the effectiveness of future legal protection.

2. METHOD

The research method employed in this paper is a normative juridical research method, with a statutory approach and a conceptual approach. The statutory approach used to examine various relevant positive legal provisions, whether sourced from Laws, Government Regulations, Ministerial Regulations, or other technical regulations, to identify norms that govern the research problem. The analysis includes the interpretation of applicable articles, the conformity between regulations, and their application in practice. Meanwhile, the conceptual approach is used to examine and analyze doctrines, legal theories, and expert views related to the issues discussed, so as to provide a strong conceptual foundation for understanding, critiquing, and building legal arguments. Through the combination of these two approaches, the research not only emphasizes the normative study of legal texts but also enriches the analysis with a theoretical conceptual perspective, resulting in a comprehensive discussion that can provide applicable recommendations and the development of legal concepts in the future.

3. RESULT AND DISCUSSION

Forms and Modes of Child Sexual Exploitation Through AR/VR Technology

The characteristics of Augmented Reality (AR) and Virtual Reality (VR)-based crimes lie in their immersive and interactive nature, providing users with a lifelike experience. This technology utilizes devices such as special glasses, motion sensors, and hand controls to create intense interaction. The resulting realism blurs the boundaries between the real and virtual worlds, increasing the potential for child sexual exploitation. Perpetrators can use this technology to create scenarios that resemble physical events, even though they occur digitally. This situation creates a significant psychological impact on victims, even though the events occur in the virtual world.

The ability to manipulate avatars of children or real victims is one factor that makes AR/VR technology vulnerable to abuse. These specially crafted avatars can resemble children, including their faces, voices, and body movements. In certain scenarios, perpetrators can even use the victim's real image taken from photos or videos and then integrate it into the virtual simulation. Deepfake technology exacerbates this risk by easily incorporating a child's face into a digital body engaged in sexual activity. This practice is not only an ethical violation, but also meets the elements of a criminal offense under Article 27 paragraph (1) of the ITE Law and Article 4 of the TPKS Law.

The most concerning type of child sexual exploitation on AR/VR platforms is the creation of child pornography content based on virtual models. Perpetrators utilize 3D modeling technology to create detailed visualizations that resemble children, then use them in sexual scenarios. Article 4, paragraph (1) of Law No. 12 of 2022 concerning Criminal Acts of Sexual Violence expressly prohibits anyone from creating, producing, or distributing material containing sexual violence against children. Law No. 17 of 2016 also stipulates that anyone who intentionally produces or distributes child pornography is subject to criminal penalties, as stipulated in Article 85. The threat of severe penalties is intended to provide a deterrent effect, but its implementation faces technical challenges.

Child grooming in virtual worlds is another form of crime arising from the use of immersive technology. The grooming process involves building emotional closeness through interactions in virtual environments, which are then used to induce victims to engage in sexual activity. Article 82, paragraph (1) of Law No. 17 of 2016 states that anyone who intentionally uses deception, a series of lies, or induces a child to commit an indecent act can be subject to criminal penalties. In a VR environment, grooming can occur without time and space constraints, thus minimizing external oversight. It makes AR/VR-based grooming a serious threat to child safety in the digital world.

The distribution of exploitative content through virtual meeting rooms adds to the complexity of handling cases. VR platforms often have virtual meeting rooms that allow multiple users to interact in real time using avatars. These spaces can be misused to display or trade child pornography without leaving a trace on the user's device. Article 27, paragraph (1) of Law No. 1 of 2024 prohibits anyone from intentionally distributing or making accessible electronic information containing indecent content. The activity can also be prosecuted under Article 81 of Law No. 17 of 2016 if it involves sexual intercourse with a child, either directly or in the form of a digital simulation involving the child as the object.

Anonymity is one of the driving factors behind the rise in child sexual crimes on AR/VR platforms. User identities are often difficult to verify because account registration systems require only an email address or minimal information. This situation makes perpetrators feel safe from tracking, thus emboldening them to commit illegal acts. The lack of strict age verification also allows children to access age-inappropriate virtual spaces. Law No. 12 of 2022, through Article 5, emphasizes the importance of protecting children from exposure to sexual content, but without robust technical mechanisms at the platform level, this article is difficult to implement effectively.

Lack of digital literacy among children and parents exacerbates the situation. Many parents do not understand the risks of interacting in virtual worlds and do not know how to supervise the use of AR/VR devices. Children who lack the ability to recognize signs of grooming or digital manipulation are even more vulnerable. Article 59A of Law No. 17 of 2016 mandates the government and society to implement comprehensive child protection efforts, including through digital literacy education. This increased understanding is a crucial step in breaking the chain of crime before it occurs.

The difficulty of digital forensics for immersive content is a major technical challenge for law enforcement. AR/VR content typically runs on servers owned by platform providers located overseas, making the data difficult for Indonesian law enforcement to access. The 3D data format and real-time interactions also complicate the evidentiary process because not all activity can be recorded traditionally. Law No. 1 of 2024 does provide the authority to order electronic system operators to delete or block access to illegal content, but its effectiveness depends on international cooperation. Without adequate technical support, the evidentiary process can be lengthy and provide opportunities for perpetrators to destroy evidence.

The link between this crime mode and existing regulations is quite clear, although it does not specifically address AR/VR technology. Article 81 of Law No. 17 of 2016 stipulates that perpetrators of sexual intercourse with children face a minimum sentence of five years in prison. Article 82 stipulates that indecent acts against children carry an equivalent penalty. Article 85 prohibits the creation and distribution of child pornography, which carries a severe penalty. On the other hand, Article 27 paragraph (1) of the ITE Law prohibits the distribution of content that violates morality, while Article 45A stipulates sanctions. The TPKS Law, through Articles 4, 5, and 6, complements the legal framework with more specific provisions regarding electronic-based sexual violence.

Integrating the application of these articles is key to prosecuting perpetrators of AR/VR-based child sexual exploitation. The Child Protection Law provides a legal basis for special protection for children as a vulnerable group. The ITE Law ensures that the distribution of illegal content through electronic media can be subject to strict sanctions. The TPKS Law provides an additional legal umbrella that regulates sexual violence more broadly, including in the digital realm. The combination of these three instruments provides law enforcement with a strong legal foundation, although technical challenges and international jurisdiction remain obstacles that must be overcome through cross-border cooperation and regulatory updates that adapt to technological developments.

Legal Protection and Law Enforcement for Children Sexual Crimes in Virtual Reality

Preventive legal protection is a key pillar in preventing AR/VR-based child sexual exploitation. The obligation for platform providers to implement an accurate age verification system is a crucial first step. This mechanism must be supported by identification technology capable of minimizing identity fraud, for example, through integration with population data or biometrics. Without policies mandating this, children can easily access virtual spaces that are vulnerable to abuse. Technical regulations requiring age verification can also be included in derivative regulations of the ITE Law or the TPKS Law to provide legal certainty for electronic system operators.

Digital literacy education for children and parents plays a strategic role in strengthening preventive protection. Digital literacy programs must be designed not only to introduce the risks of immersive technology but also to provide practical skills to identify signs of potentially dangerous interactions. This awareness-raising can be achieved through school curricula, community-based training, and consistent public campaigns. Law No. 17 of 2016, specifically Article 59A, mandates the government to implement comprehensive child protection efforts, which can be realized through digital literacy training. Synergy between the government, platform providers, and civil society organizations is key to the success of this strategy.

Establishing cyber safety standards is an additional instrument that strengthens preventive legal protection. These standards include technical requirements for managing user interactions, including automatic filtering of sexual content, rapid reporting systems, and real-time monitoring of user behavior. AR/VR platform providers can be required to comply with standards issued by government-appointed regulatory or supervisory bodies. Implementing such standards will minimize the opportunity for child sexual exploitation while increasing the accountability of digital service providers. Regulations regarding safety standards can be included in revisions or implementing regulations of Government Regulation No. 71 of 2019 concerning the Implementation of Electronic Systems and Transactions.

Repressive legal protection focuses on taking firm action against perpetrators of immersive technology-based sexual crimes. Law No. 17 of 2016 provides a clear legal basis through articles such as Articles 81 and 82, which regulate the criminal acts of sexual intercourse and indecent acts against children. Law No. 12 of 2022 (TPKS) strengthens this provision by including electronic-based sexual violence as a punishable offense. Law No. 1 of 2024 concerning the Second Amendment to the ITE Law regulates sanctions for the electronic distribution or creation of content that violates morality, including

child pornography. The combination of these three instruments provides a solid legal basis for imposing maximum penalties on perpetrators.

Criminalization of perpetrators based on specific articles is carried out to ensure that sentences are proportionate to the severity of the crime. Article 81 of Law No. 17 of 2016, for example, stipulates a minimum prison sentence of five years and a maximum of fifteen years, along with a fine of up to five billion rupiah, for perpetrators of sexual intercourse with children. Article 4 of the TPKS Law prohibits the creation and distribution of sexually violent material, which can be used to prosecute perpetrators who produce immersive AR/VR-based content. Meanwhile, Article 27 paragraph (1) of the ITE Law provides a legal framework for prosecuting the distribution of such content through electronic media. Consistent sanctions will have a deterrent effect and reinforce the message that child sexual exploitation will not be tolerated.

The mechanism for confiscating and removing content through notice and takedown is a crucial part of the repressive strategy. This process allows law enforcement officers or relevant authorities to order platform providers to immediately remove content containing elements of child sexual exploitation. The ITE Law and Government Regulation No. 71 of 2019 provide the legal basis for issuing such takedown orders. Effective implementation requires cooperation between authorities, electronic system operators, and internet regulatory agencies. Speed in implementing takedowns is key to preventing further spread and minimizing psychological harm to victims.

Cross-border jurisdiction is a major obstacle to law enforcement regarding AR/VR-based sexual crimes. Many platforms operate with servers located outside of Indonesian jurisdiction, necessitating international cooperation. Differences in legal systems, evidentiary procedures, and priority levels for handling cases in each country can slow down the prosecution process. Instruments such as Mutual Legal Assistance (MLA) agreements and membership in international conventions can help expedite the exchange of data and evidence. Harmonization of regulations with global standards is also needed to facilitate smoother extradition or data request processes.

The limitations of digital forensic evidence in immersive content add to the technical barriers to law enforcement. Evidence in the form of 3D interactions or real-time simulations is difficult to document traditionally. Currently available recording technology is not capable of capturing all dimensions of user interactions in virtual spaces. Law enforcement requires specialized forensic software that can extract, record, and verify activity in AR/VR

environments. Investment in the development of this forensic technology is urgently needed to ensure the evidence collected has legal force in court.

The lack of technical skills among law enforcement officers also hampers the effectiveness of prosecution. Knowledge of immersive technology, perpetrator disguise methods, and digital investigative techniques remains limited among investigators. Special training programs need to be held periodically to increase the capacity of officers to handle AR/VR-based cases. Collaboration with academics and cybersecurity practitioners can help accelerate the knowledge transfer process. This capacity building will support the implementation of existing articles, ensuring optimal law enforcement.

Strengthening the legal system requires harmonization with international standards such as the Budapest Convention on Cybercrime and the Lanzarote Convention on the Protection of Children against Sexual Exploitation and Sexual Abuse. Both instruments provide technical and procedural guidelines for addressing cross-border child sexual crimes involving technology. Developing the capacity of cyber units within the police force must also be accompanied by increased international cooperation through intelligence exchange and operational coordination. The establishment of a dedicated unit focused on immersive technology-based sexual exploitation can expedite the investigation and prosecution process. Integrating national law with global commitments will strengthen Indonesia's position in combating AR/VR-based child sexual crimes.

4. CONCLUSION

AR/VR-based child sexual exploitation practices are increasingly complex, exploiting the immersive and interactive nature of these technologies. Perpetrators can create child avatars or manipulate virtual models to produce sexual content, engage in virtual grooming, and even distribute such material through closed platforms. Existing regulations, such as Law No. 17 of 2016 concerning Child Protection, Law No. 1 of 2024 concerning the Second Amendment to the Electronic Information and Transactions Law (ITE Law), and Law No. 12 of 2022 concerning the Criminal Procedure Code (TPKS), provide a strong legal basis for prosecuting perpetrators. However, legal loopholes remain in specific regulations regarding immersive technology, limited evidentiary mechanisms for interactive 3D content, and cross-border jurisdictional challenges that perpetrators often exploit to evade prosecution.

Regulatory reform is urgently needed to ensure legal provisions are able to address the ever-evolving nature of technology-based practices. Improving the technical capacity of law enforcement officers through digital investigation training, mastery of AR/VR forensic

technology, and strengthening cyber units will enhance the effectiveness of law enforcement. Cross-sector collaboration between governments, platform providers, civil society, and international institutions needs to be expanded to accelerate information exchange and strengthen notice and takedown mechanisms. The effort will provide optimal protection for children while eliminating opportunities for perpetrators to exploit technological gaps for sexual exploitation.

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