

# An Exploration of Legal Risks and Multi-dimensional Regulatory Paths for AR Publications in the Digital-Intelligence Era: Postprint

**Authors:** Lu Guixi Wang Zhuang

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## Abstract

**Objective:** AR publications provide readers with immersive reading experiences through the fusion of virtual and reality; however, as a “double-edged sword,” this new technology also introduces numerous legal risks. Against the backdrop of the digital-intelligence era, there is an urgent need to thoroughly analyze the legal risks brought by AR publications and to explore and propose effective regulatory pathways and strategies. **Method:** The study selects the representative AR publication series “Science Runs Out” for case analysis. **Results:** It points out the legal risks of AR publications in the digital-intelligence era regarding intellectual property infringement, privacy rights and data security, as well as content supervision and compliance review. **Conclusion:** It proposes targeted regulatory pathways, including technology-empowered intellectual property protection, establishment of a collaborative supervision system and mechanism, and adherence to the unity of rigidity and flexibility.

## Full Text

### Preamble

#### Exploring Legal Risks and Multi-dimensional Regulatory Paths for AR Publications in the Digital Intelligence Era

Lu Guixi<sup>1</sup>, Wang Zhuang<sup>2\*</sup>

(1. Shandong University, Weihai, Shandong 264209; 2. Beijing Language and Culture University, Beijing 100083)

#### Abstract:

**[Objective]** AR publications provide immersive reading experiences by blending virtual and reality, yet as a “double-edged sword,” these new technologies also introduce numerous legal risks. Against the backdrop of the digital intelligence

era, there is an urgent need to deeply analyze the legal risks posed by AR publications and explore effective regulatory paths and strategies. **[Method]** This study selects the representative AR publication series *Science Runs Out* as a case for analysis. **[Results]** The research identifies legal risks in three domains: intellectual property infringement, privacy rights and data security, and content supervision and compliance review. **[Conclusion]** The paper proposes targeted regulatory paths including technology-enabled intellectual property protection, establishment of collaborative supervision systems, and adherence to the unity of rigidity and flexibility.

**Keywords:** digital intelligence publishing; AR technology; legal risks; regulatory paths

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\*Corresponding author

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## 1. Problem Statement

In recent years, internet technology has fundamentally transformed how people communicate, interact, and share information. With the arrival of the digital intelligence era, exemplified by artificial intelligence technology, cutting-edge digital technologies have become crucial drivers of new quality productive forces. Humanity has entered a transformative epoch of widespread AI application and continuous innovation, where digitization has become a mandatory challenge for all industries. From Web1.0 to Web2.0, and now to emerging technologies such as AR (augmented reality), VR (virtual reality), the metaverse, and generative AI, digital intelligence technologies have not only revolutionized content production, dissemination, and application, but have also profoundly reshaped traditional industrial operational models and business logic. In the publishing sector, these technologies have triggered unprecedented transformations, propelling the industry from print publishing toward intelligent and smart publishing. As an innovative emerging technology, AR technology is being widely adopted in publishing, gradually permeating various aspects of our lives and

generating profound impacts. However, while AR publications drive revolutionary development in the publishing industry, they also trigger a series of complex legal risks that form bottlenecks for deep integration in the publishing sector, urgently requiring thorough analysis and effective solutions from government and researchers.

Within legal systems, intellectual property law maintains a special connection with technology and the economy—it is both a product of modern commodity economy and scientific-technological development, and a result of the “dematerialization revolution” of property in private law. Traditional book-related intellectual property disputes typically concentrate on copyright issues, but AR publications contain far more elements than conventional books. They face not only challenges in copyright infringement and protection, but also significant risks regarding patent and trademark rights.

## 2. Threefold Legal Risks of AR Publications in the Digital Intelligence Era

### 2.1 Intellectual Property Risks

AR publications, as an emerging technological application, incorporate extensive multimedia elements beyond traditional text and images, including audio, video, and 3D models. On one hand, the unique nature of AR publications makes content reproduction and dissemination easier, posing tremendous challenges to copyright protection. Consequently, creators must implement comprehensive copyright protection for their works, requiring not only confirmation of rights for basic elements like text, images, audio, and video, but also full consideration of the special characteristics of interactive design and virtual elements in AR publications. Similar to audiobooks, infringement evidence in AR publications often appears in electronic data form, which can be more easily modified or deleted with minimal trace, significantly complicating evidence preservation and notarization. On the other hand, the multitude of elements in AR publications creates disputes over the copyrightability of some novel composite materials. Furthermore, the primary difference between AR publications and traditional books lies in their technological application, and wherever technology is applied, patent risks increase substantially—such as unauthorized use of others’ patented technologies or infringement of patent rights. In China, patent law protects three types of objects: invention patents, utility model patents, and design patents. Since AR publication production relies on the collaborative completion of multiple technologies including augmented reality, image processing, audio processing, and video 特效 technologies, it involves all aspects of patent protection. This not only creates difficulties in accurately categorizing patent types during application, but also poses significant challenges for determining patent infringement liability. Additionally, although book trademarks are protected under China’s Trademark Law, issues such as unclear regulations regarding book titles and cover designs remain controversial. The emergence

of AR publications exacerbates these problems while creating dilemmas of repeated trademark registration and preemption, as well as trademark monopolies by foreign publishing companies.

## 2.2 Privacy and Data Security Risks

Reading AR publications often requires accompanying mobile apps that demand various permissions from readers, such as access to contacts, device models, and accounts on other platforms. After obtaining such personal information, platforms may utilize algorithms to tag readers, subsequently conducting content 推送 and advertising based on these tags. If application security measures are inadequate, some platforms or individuals may even sell collected personal information to third parties for profit, resulting in illegal collection, use, alteration, or leakage of personal information that seriously infringes upon readers' rights to know about, choose, and decide how their personal information is processed. Moreover, AR publications represent a relatively new field for data security and risk management. Much data relies on transmission between user devices and central servers, a process vulnerable to interception, alteration, or theft, seriously threatening readers' data and information security—for instance, when foreign SDK providers withdraw technical authorization. As AR technology updates rapidly in the AI era, security vulnerabilities and data risks emerge endlessly, making it a major challenge to find balance between technological updates and data protection to ensure user data security. Beyond this, readers still lack awareness regarding privacy and data security protection in AR publications. Since AR publication reading requires operational interaction, readers' physical and location information is inevitably recorded by relevant systems. This information includes both data obtained by book designers and developers through privacy terms and permission requests, and information voluntarily input by readers. Throughout this process, readers find it difficult to maintain vigilance and privacy protection awareness, and China currently lacks clear laws and regulations targeting new infringement methods like AR publications. Under current legislative attitudes, parties bear the burden of proof for their claims, meaning that once personal information leakage occurs, readers face significant difficulties in proving damages.

## 2.3 Content Supervision and Compliance Review Risks

Content supervision and compliance review are crucial for book publishing. The National Press and Publication Administration and other units have repeatedly issued guidance on strengthening digital publishing content management. However, as digital transformation deepens, the diverse content forms of AR publications pose greater regulatory challenges. Regulators must confront not only traditional text and image content, but also large volumes of hypermedia content including 3D models, interactive design, and lighting 特效. Since AR publication content often features real-time updates and dynamic interaction—meaning readers can interact with book content in real time through AR

technology, and content may change according to reader interaction—this complexity requires regulators to deploy more interdisciplinary talent with technical capabilities and professional knowledge to effectively supervise AR publication content. Meanwhile, this real-time and dynamic nature makes content supervision more difficult, requiring regulators to monitor AR publication content in real time to ensure compliance with relevant laws and regulations, thus causing regulatory costs to surge dramatically.

Currently, traditional supervision and review processes focus primarily on content, while the AR publication field has yet to form unified technical standards. This leads to compliance challenges when promoting AR publications globally, affecting the “going out” process of Chinese AR publications. The absence of technical standards results in different publishers or enterprises adopting varying technical routes, implementation methods, and compatibility when producing AR publications, creating uncertainty for user experience. To address challenges from new technologies, domestic industry organizations such as the Virtual Reality Industry Alliance (IVRA) have made some attempts. For example, IVRA released the *General Specifications for Virtual Reality Head-Mounted Display Devices*, providing a basis for performance definition and measurement methods for VR head-mounted display devices. Such standards are significant for regulating markets and improving product quality. However, at the AR publication content and application level, China still lacks systematic norms.

### 3. Multi-dimensional Regulatory Paths for AR Publication Legal Risks in the Digital Intelligence Era

#### 3.1 Flexible Application of Judgment Standards: Advancing Industry Self-regulation and Technology Empowerment

Establishing a robust intellectual property protection mechanism forms the foundation for promoting the healthy and sustainable development of AR publications. From a copyright protection perspective, AR publication producers should clearly label all copyright information for text, image, and model creators in prominent book locations, enabling readers to clearly understand copyright sources. This both respects creators’ creative labor and conveys copyright protection awareness to readers. Naturally, due to the special nature of AR publications, copyright information involves multiple forms. Therefore, labeling methods should advance with the times. Beyond adding copyright statements on covers, table of contents pages, or content pages like traditional books, virtual interactive elements can embed copyright information within virtual scenes, or audio modules can declare patent information through voice prompts.

Regarding copyrightability determinations for composite elements and machine-generated elements, originality judgment standards should be applied flexibly. According to China’s Copyright Law, the object of copyright is original works that must simultaneously meet two conditions: “independent creation” and “minimum creativity.” Simple element 堆砌 combinations should not receive copyright

protection. However, if generated elements involve input of human independent thought or expression, their originality contributions should be affirmed to some extent. Indiscriminately denying users' contributions is unfair; if those willing to experiment with new tools and create new content cannot obtain incentives, the core purpose of the Copyright Law to incentivize creativity cannot be fully realized.

From a patent protection perspective, creators and designers should conduct comprehensive patent searches and analysis during early AR publication R&D to understand existing technological levels and patent distributions, thereby avoiding redundant R&D and infringement risks. They should then reasonably plan patent application timing and layout strategies according to R&D progress and market demands to form an effective patent protection network. For examination institutions, they should clarify authorization standards and categories for AR publication patents to ensure granted patents possess novelty, creativity, and practicality, giving higher priority and protection strength to AR publication patents involving key technologies and core innovations. From a trademark protection perspective, on one hand, AR publication designers and creators should conduct comprehensive, multi-field layouts, appropriately adopting defensive registration and multi-category registration methods—but with limitations, as some defensive registrations can actually be avoided through improving commodity and service classification systems and distinctiveness judgment rules. On the other hand, industry self-regulation and cooperation should be promoted by introducing copyright credit mechanisms for collaborative governance of infringement dilemmas and establishing trademark information sharing platforms to facilitate enterprises' timely understanding of industry dynamics and trademark infringement information. Notably, in the AI era, technological means such as OCR, digital watermarking, encryption, and blockchain can be fully utilized to protect special content in AR publications.

From a legal perspective, compliance with relevant laws and regulations forms the cornerstone of protecting user data security. China's traditional laws for protecting personal privacy mainly include the Civil Code, Criminal Law, and Personal Information Protection Law. AR publication designers and developers must strictly follow these laws and regulations, ensuring they always adhere to principles of legality, legitimacy, and necessity when collecting, storing, processing, and transmitting user data to safeguard readers' personal privacy and data security. However, in the digital intelligence era, users' disadvantaged position is further intensified, necessitating reasonable expansion of user rights. For instance, the original notification-consent mechanism should be optimized: data controllers should notify users in obvious, clear, and understandable ways to ensure effective notification delivery, and implement tiered consent standards based on personal information type—the more important and sensitive the personal information, the higher the consent threshold should be. Users should have complete rights to refuse, delete, and ultimately interpret their personal information data to counterbalance data controllers' advantageous position in the digital intelligence era.

From a technical perspective, AR publication designers and developers should adopt advanced encryption technologies to encrypt user data, ensuring security during transmission and storage to build robust security protection barriers. For example, they can deploy differential privacy (introducing noise to obscure data), federated learning (distributed machine learning to reduce data transmission costs and risks), and generative adversarial networks (generating highly realistic virtual datasets), while comprehensively implementing multi-level security measures including access control, security auditing, and intrusion detection to strictly prevent data leakage and abuse. From an organizational perspective, publishing houses should strengthen internal management to enhance employees' security awareness and operational skills, reducing data leakage risks from the source. Additionally, as readers in the digital intelligence era, individuals should also improve their personal information privacy protection awareness when reading AR publications. For example, when using AR publication apps, they should carefully read and understand authorization 提示 information, cautiously grant apps permission to access personal information, and firmly refuse or disable unnecessary permission requests. They should also develop good data cleaning habits, regularly checking and clearing personal information on AR publication platforms, including sensitive data such as reading records and browsing history, and promptly cancel or delete relevant information for unused accounts or applications.

### **3.3 Establishing a Collaborative Supervision System: Upholding the Unity of Rigidity and Flexibility**

The greatest challenges currently facing AR publication content supervision and compliance review are the relatively singular regulatory subjects and the lag of targeted laws and regulations behind technological iteration. From the perspective of digital publishing industry supervision practice, regulatory subjects mainly include five types: relevant department supervision, enterprise self-supervision, industry internal supervision, media supervision, and social supervision. However, the latter three have not yet become mainstream, with relatively weak regulatory strength, urgently requiring strengthened guidance for media supervision and industry internal supervision. In the future, the AR publishing field should form a multi-agent collaborative supervision system to ensure regulatory strength and accuracy. Naturally, since AR publications are entirely new products of the digital intelligence era, attention should also be paid to combining rigid and flexible supervision, adhering to the principle of unifying value rationality and instrumental rationality to make appeal and defense channels more smooth and diverse. On one hand, this relies on mandatory measures such as clear laws, regulations, and policy standards to set insurmountable bottom lines for market participants, including strict content review to ensure healthiness, positivity, and alignment with mainstream social values. On the other hand, more flexible and efficient methods should be used to respond to market changes by encouraging industry associations to formulate industry norms higher than legal standards, guiding enterprises toward self-improvement, and

utilizing advanced technologies like big data and artificial intelligence to enhance supervision efficiency. Simultaneously, public participation should be strengthened by establishing feedback mechanisms to make consumer and user voices important bases for supervision, thereby promoting systematic, scientific, and rational development of AR publication content supervision and compliance review. Moreover, for digital frontier technologies like AR, significant legal gaps and ambiguities exist, with legislation, judiciary, and enforcement struggling to keep pace with technology. Therefore, government and relevant institutions need to closely monitor dynamic changes in the AR publication market, timely revising and improving relevant laws and regulations to adapt to challenges brought by new technologies.

Naturally, AR publications contain rich elements with higher technical content compared to traditional books, making technical supervision essential. However, unified technical supervision standards have not yet been formed, leading to market issues such as uneven data quality, inconsistent data formats, and difficult data security guarantees. In 2023, the Central Committee of the Communist Party of China and the State Council issued the *Overall Layout Plan for Digital China Construction*, clearly stating that Digital China construction must consolidate the “two foundations” of digital infrastructure and data resource systems. Therefore, it is necessary to fully leverage the roles of government, industry associations, enterprises, and other multiple forces to formulate unified data standards and norms, ensuring the unity, standardization, and operability of data quality, data structure, and data exchange. The government can introduce relevant policies to guide and support the formulation and implementation of data standards; industry associations can organize experts for research and discussion to formulate industry-specific data standards; enterprises can actively participate in standard formulation and implementation to promote standardized development of the AR publication market.

Digital intelligence publishing has become an important component of the cultural industry. The extensive and deep application of artificial intelligence and other new technologies in publishing is a crucial measure to vigorously promote industrial integration and high-quality development. In the digital intelligence era, AR publications launched using new technologies like AI represent important symbols of the publishing industry’s continuous product innovation and new reading ecology construction. AR, VR, and MR publishing resources have transformed traditional book reading methods, but their attendant legal risks also warrant deep reflection. Only by adhering to the overall 思路 of unifying value rationality and instrumental rationality, seeking balance between technological development and human values, and creating a new situation of multi-agent collaborative governance for technology application risks, can we ensure the content quality and educational value of such publications, promote digital intelligence technologies represented by AR as important engines for technological transformation and industrial empowerment, and facilitate the free flow and efficient allocation of production factors in the publishing industry to safeguard comprehensive high-quality development.

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### Author Biographies:

Lu Guixi (2001–), male, from Qingdao, Shandong, Master’s student at Shandong University, research interests include civil and commercial law, intellectual property, and computational law.

Wang Zhuang (1969–), female, from Changchun, Jilin, Ph.D., Professor and Doctoral Supervisor at Beijing Language and Culture University, research interests include digital publishing, international publishing, and children’s reading and publishing.

### (Responsible Editor: Li Yansong)

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