

AI-Driven Media Compliance: Technical Innovations and Regulatory Challenges in Hong Kong-Mainland Data Flows

Shixin Liao *

School of Journalism & Communication, Jinan University, Guangzhou 510000, China

* Corresponding Author Email: sxliao@stu2023.jnu.edu.cn

Abstract. This research presents, therefore, AI technologies involved in cross-boundary flow of media data between Hong Kong and China and their related compliance issues. Through a case study and comparative methodology, the paper reviews the technical architecture of cross-boundary AI media operations, applying Oriental Pearl New Media's AIGC Platform and Generative AI Research Center, Hong Kong. An endeavor inspired by this paper can bring to light adaptive innovative solutions such as "compliance-aware inference" and "dual-gate architecture." Divergent legal frameworks highlight regulatory gaps, with their discussions tending to give an indication of the larger problem that businesses would like to take some implicit exemption under their coverage of having region-specific infrastructure configurations and also differentiated editorial policies some of which we identify in this study. Therefore, it recommends industry-specific regulatory guidance, a sandbox approach, and unified compliance certification to lift the ongoing obstacles and concludes with compliance by design - rather than remedial approaches - offering the most sustainable path forward for cross-boundary media operations amidst complex regulatory environments.

Keywords: Cross-boundary data flows; media compliance; Greater Bay Area; generative AI; data localization.

1. Introduction

The media industry is at a critical junction with real AI systems integration into their core processes—a fourth major media technological revolution after paper, radio, and the internet eras. At the center of this new era is data—that is, how content is created, distributed, and consumed throughout the entire media value chain. A.I. technologies have been re-directing old workflows through dynamic modeling of real-time human behavior toward the development of content personalization as well as automation in the production process. An example of this is the National 5G New Media Platform of China Media Group and "Kuaibi Xiaoxin" robot of Xinhua News Agency, which writes financial and sports news articles generating the news cycle [1, 2].

The use of AI, however, does not only come with benefits, but also creates some difficult issues which need to be solved, especially in the cross-border context. Ad-tech compliance has sometimes brought previously rather lax contrasting rules about data sovereignty and privacy standards in Hong Kong in contrast to China to its extremes. Even though Hong Kong has more relaxed laws to work under, such as the PDPO, Greater China has more demanding laws, such as the PIPL, along with required onshore data storage for critical information, creating difficult compliance standards for media companies that are doing cross-border work [3-5].

This paper throws the limelight on the technical implementation and regulatory challenges of AI-driven cross-boundary media data flows between Hong Kong and Mainland China through representative cases regarding the AIGC platform of Oriental Pearl New Media Co., Ltd., and the collaborating entity of Hong Kong Generative AI Research and Development Center with Phoenix Smart Media. The tech architecture, regulation frameworks, and industry adaptation strategies would provide actionable insights to the researcher in balancing innovation imperatives with compliance obligations in such a rapidly evolving landscape and hence contribute to sustainable development of an integrated media ecosystem in Greater Bay Area (GBA).

2. Literature Review

2.1. AI in the Media Industry

Due to the transformation of the media by the ever-expanding use of AI, content is differently created, distributed, and consumed in the new media ecosystem. Across the value chain, AI-driven natural language generation, generative AI, and machine learning have found themselves at the center of the AI-enabled automated journalism, personal recommendations, and efficient data analysis process. Xinhua News Agency's "Kuaibi Xiaoxin" is an example of one application for automating journalism that writes quick financial and sports stories, optimizing production cycles. Just as Netflix and Spotify use AI for their recommendation systems to promote content and improve user engagement, the supply chain also adopts AI for such purposes.

Yet, AI in media poses challenges too, particularly algorithmic bias and, of course, all those ethical and data privacy issues. Previous studies shed light on how biased training data or the algorithm can result in content recommendations heuristically skewed or least represented certain groups, enhancing societal inequalities [9, 10]. The other dimension of ethical concerns is the possible misuse of AI for misinformation or giving a journalistic topic sensationalism as well as the labor dynamics in journalism [11]. Such challenges only strengthen the need for AI adoption in the media to be guided by valid ethical frameworks and regulatory oversight [12].

2.2. Cross-Boundary Data Flow Challenges

Sectors hinged on data-centric technologies need frictionless cross-boundary data flows. In the case of Hong Kong and Mainland China, such differences in frameworks create huge challenges for enterprises in the media industry. PDPO versus PIPL is an illustrative case; China's commitment to data localization stands sharply in contrast to Hong Kong's lax attitude even now creating legal ambiguities in cross-border operations [13].

Recent efforts within the GBA Standard Contract aim to harmonize these differences through a framework that standardizes compliance requirements for personal data transfers between Hong Kong and Mainland cities [14, 15]. But practical implementation will remain complex if not impossible. For example, such discrepancies in regulation are being brought about by the integration of the mainland film models by the AIGC platform of the Oriental Pearl New Media Co., Ltd. with data of user behavior from Hong Kong. Another such example is the collaboration between the Hong Kong Generative AI Research and Development Center and Phoenix Smart Media in the development of multilingual corpora based on differing standards of privacy [13].

2.3. Ethical Implications of AI in Media

The ethical subject matter in AI from the media is of several folds. Deepfake technology represents the risks that occur due to the misuse of AI. An example is in Shanghai during the rumor of 2024 when criminal actors leveraged AI tools to rewrite articles and avoid detection, thus alluding expressively to the coherence that foments misinterpretation: Misinformation proliferation can, therefore, be enhanced. Such examples underline the sometimes rather desperate need for robust countermeasures against unethical AI applications.

Moreover, personalized content delivery systems have the potential to create and exacerbate a phenomenon called "filter bubbles," where people can only access information that reflects and reinforces their existing beliefs. In this regard, much apprehension exists about the issue of attenuating perspective diversification as well as the building of echo chambers [17]. Observers say that ad-hoc ethical guidelines for media practice are a must to harness AI while managing its attendant risks responsibly [18].

2.4. Research Gaps

Some gaps are left even after extensive research on the impact of AI on media and cross-border data flows. Most importantly, there is not much empirical analysis of how media organizations

navigate compliance challenges with conflicting legal requirements across jurisdictions. Much focus is given to ethical considerations of AI applications broadly and specific guidelines should be made based on cross-border media operations. The last is that there is a need for much more case study research about successful strategies that help technological innovation be matched with regulatory compliance.

3. Technical Implementation of AI in Cross-Boundary Media Operations

3.1. Technical Architecture and Infrastructure Requirements

Cross-boundary media AI systems between Hong Kong and Mainland China require specialized architectures that balance performance, compliance, and operational efficiency. At the heart of it lies a distributed data processing framework, comprising essentially four mainly geographical segmentations of data collection nodes, jurisdiction-specific preprocessing layers, federated machine learning systems, and containerized deployment environments, respectively. Typically, in this case, regionalized media implementations come by way of data lakes interconnected via very secure API gateways to meet the data-localization needs of Mainland China yet easily managed from an operational point of view [19].

Some researches indicated isolated storage architectures with differential access control demands in terms of data classification and source, in which an API-based, rather than direct database access, integration is needed. For the support of such architectures, Chen put forward his solution to realize cryptographic attestation of data origin and automated compliance checks, as well as standard metadata schemas [22].

Proposed technical standards to be developed include standardized data tagging specifications and content classification taxonomies that map to regulatory requirements in both regions at the API layer to document cross-boundary transfers, respectively [23].

3.2. Case Studies: Technical Solutions for Regulatory Compliance

3.2.1. Global Investment Bank's AI-Powered Data Governance Framework

A top-tier global investment bank deployed an AI-powered data governance framework to tackle the regulatory compliance challenge within a hybrid cloud environment [24]. It centrally unifies on-premises and cloud systems to operate the data securely and within the compliance boundaries of all the nations. This comprises three core building blocks to work together to ensure governance and compliance to all regulations. First, AI-driven anomaly detection deploys machine learning models that make it possible to track transactions in real-time and flag potential compliance breaches such as fraud or money laundering. It also includes an automated metadata management system for proper data classification and tagging, which also aligns with regulations like GDPR [25] and CCPA [26]. The dual-logging system automatically deploys to enable immutable audit trails in both cloud and on-premises environments to offer an open and verifiable pathway throughout data processing.

For cross-border operations, the bank uses "compliance-aware workflows," keeping within the jurisdiction the sensitive data and leveraging only cloud scalability for the non-sensitive workloads. This has manifested in the way it treats customer data, which under GDPR is processed onshore in Europe and then anonymized as a dataset for use within global analytics operations. The roll-out of this advanced governance solution bears major results having compliance breaches down 30% and operational efficiency heightened up 20% [27].

3.2.2. Hong Kong Generative AI Research Center's Federated Learning Platform

In cooperation with a leading media group, the Hong Kong Generative AI Research Center has rolled out a federated learning platform to address jurisdiction-specific compliance needs for content generation. The technology comprises a collection of innovative components that promise to navigate the complex regulatory environment. Dual-gate architecture ensures separate but synchronized training environments in which Hong Kong-specific data is processed locally while benefiting from

aggregated insights derived from global datasets. Jurisdiction-specific content screening implements automated compliance checks through local rule sets to ensure regional regulation-based generated content. Secure data exchange goes further to endow the multi-party computation application with end-to-end encryption and jurisdiction-specific key management--features that ultimately enable secure collaboration between the Hong Kong and overseas groups.

Cantonese news generation conforms to federal learning. The model is trained on datasets within their borders. Data remains within boundaries; no raw data is sent across the borders. This is one of the methodologies to ensure compliance with the privacy laws of Hong Kong. The accuracy of the model is improved by a margin of 35%. The system further comes with a single dashboard that ensures monitoring of compliance metrics in content workflow management. Thus, the system administrators have full oversight capacities [29].

3.3. Technical Approaches to Legal Compliance Challenges

3.3.1. Data Localization Technologies

Cross-boundary media operations address divergent data localization requirements through distributed processing architectures, which are indeed very different in complying with regulations of different jurisdictions. Such architectures typically involve combining data collection and preliminary processing within the jurisdiction of origin to comply with the local regulation of the country. Technical implementations cover automated data classification that governs information sensitivity and jurisdictional requirements, containerized processing environments with geographical access control, and cryptographic methods (such as attestations via blockchain to verify data residency and storage location) [30].

Cloud deployments are often carried out within "isolation zones," which are essentially virtual private cloud environments, where there is very strict network segregation and jurisdiction-specific access controls. Such environments allow an organization to maintain the constraints surrounding the place of storage of data while in operation, scaling, and maintaining a productive system [31]. Putting compliance controls right into the infrastructure would enable organizations to comply with the regulation while keeping in mind the requirements of international operation.

3.3.2. Anonymization and Encryption Techniques

Ensuring highly secure cross-boundary operations while protecting personal information, the media houses apply advanced anonymization and encryption measures. Differential privacy frameworks, which are general in applications like health and government and now re-purposed for media analytics, provide a quantifiable assurance against re-identification mathematically, thus enabling insight derivation from the aggregative data without exposing individual identities [31]. Among others, there are federated learning, synthetic data generation, and homomorphic encryption as such privacy-preserving AI training methodologies, thus improving machine learning models across borders without direct data exchange on sensitive matters [32].

Another approach involves what is known as "jurisdictional data sharding"; it separates PII from other data types - content or behavioral analytics, for instance, to enable organizations to carry out cross-border analytics while falling in line with local compliance requirements. There have been reports that some organizations may also use this technique for purposes of content performance analysis across markets, so long as PII remains stored in its jurisdiction of origin [33]. Such approaches denote technical innovation that will facilitate, in letter and in spirit, regulatory adherence without truncating operational objectives.

3.3.3. Dual-Consent Management

Cross-border media operations are increasingly working with consent lifecycle management systems, in which jurisdiction-specific consent records maintain proper data residency controls [34]. The systems have interfaces optimized for the geography and granular permission structures mapped to requirements from those diagrams, not to mention APIs to verify compliance with consent across borders.

The innovation by Phoenix Television is its 'consent passport,' which is cryptographically verifiable records of permission that works across boundaries of jurisdictions in verification without us removing the underlying personal records and data. This is in conformity with Mainland China's requirements of a preventive review and yet enables supports the provisions of flexible consent withdrawal available in Hong Kong [35]. Second, through 'consent propagation mechanisms,' updated permissions can be automatically enforced in distributed systems, preserving jurisdiction for audit trails. This way of building compliance into technology creates room for media companies to maneuver through complex cross-border regulations.

4. Regulatory Framework and Compliance Analysis for Cross-Boundary Media Data Flows

4.1. Comparative Analysis of Legal Requirements

The regulatory frameworks governing Hong Kong-Mainland China conditions for cross-boundary data flows reflect fundamentally different approaches to data governance. Under the "One Country, Two Systems" principle of Hong Kong, media regulation is within a relatively liberal framework while Mainland China adheres to "cyber sovereignty" principles that believe in more state supervision. In the constitutional divergence that this creates, inherent tensions arise for cross-boundary media operations.

The PDPO in Hong Kong exempts "news activity" under Section 61 plus goes for a principles-based way of data protection. On the other hand, The PIPL of Mainland China implements a prescriptive framework without journalistic exemptions, but with limited exceptions for public interest or legal obligations. These different approaches create asymmetric compliance challenges for cross-boundary reporting and media production. Hong Kong post-publishes the enforcement of laws and industry self-regulation over content; China is all pre-published with the provisions on the Management of Internet News Information Services.

AI regulation showcases a lightning striking degree of regulatory divergence. Comprehensive AI-specific legislation is currently absent in Hong Kong, though reliance can be placed on the sort of general privacy frameworks as outlined by PDPO. The consent required from users of services differs significantly from what is to be expected on the mainland. The Generative AI Service Management Measures for Mainland China ultimately impose heavy obligations on AI service providers in terms of registration, security assessments, and content monitoring. In consequence, for cross-boundary media operations, differential controls must be mapped out for AI systems based on their deployment location and target audience.

It shall increase the complexity of the 2020 Hong Kong National Security Law, which potentially may be understood to capture certain data transfers. Indirectly or directly transboundary politically sensitive content may also come under that law and thus, a heightened review.

4.2. Industry-Specific Compliance Requirements in Hong Kong

Media-specific data governance balances press freedom concerns with the concern for data protection that has developed in Hong Kong. "The Privacy Commissioner for Personal Data has issued guidance specifically for the media sector. Entitled 'Guidance Note on Data Protection for Journalists,' it includes a balancing test between considerations of privacy against considerations of the public interest disclosure." PCPD explained that Hong Kong-based media companies sending personal data to mainland data processors are responsible for compliance with PDPO.

Voluntary guidelines for the application of AI in journalism have been initiated by industry bodies. The Hong Kong Association of Media Professionals has come up with ethical frameworks, and the Human Rights and Hong Kong Journalists Association's "Ethical Guidelines for AI in Journalism" highlights the needs for human control over AI systems, especially for content created to cross jurisdictional boundaries.

Significant legal precedents are from the case of Hong Kong Television Network Limited vs. Commissioner for Personal Data Protection and this ruling states very clearly that the exemption of the PDPO "news activities" applies only to the activities directly associated with news gathering and reporting but not the ancillary functions like advertising or audience analytics [36]. The ruling acquires an immense impact on sharing data across boundaries in a non-journalist set-up.

Another key source of compliance requirements is through the regional initiatives within the framework of GBA. For instance, the Hong Kong-Guangdong Media Cooperation Framework Agreement and the "Action Plan for Media Convergence and Innovation" within the Qianhai Cooperation Zone, bring about provisions under which structured protocols for standardized data exchange will be created, and content standards will be mutually recognized reciprocally within specific categories of material.

4.3. Compliance Workflow for Media Data Transmission to Mainland China

Media organizations must set up compliant workflows - structured across three data transmission phases. Pre-transmission includes classification of data based on Mainland China's regulations within the scope of DSL categories and classifications specific to media. Media content requires careful classification under Mainland China's regulations - sensitive personal information in news material may be subject to very tight control, even though journalistic protections could be available within the Hong Kong legal framework. This is followed by the determination of the security assessment regarding the amount of data, its sensitivity, and the potential impact, with verification of exemption for some categories of media content as per certain specific CAC guidelines, like standard export Measures for Data Security Assessment.

In transmission, the firms shall implement the Cross-border Data Transfer Security Certification Guidelines from the Technical Requirements Perspective and adhere to content review deadlines ranging typically from 3 to 5 days for news content and from 7 to 15 days for entertainment and user-generated content. Technical compliance certification under MLPS 2.0, which mandates tiered cybersecurity measures based on system risk levels, shall be required for systems that process cross-boundary media data.

Post-transmission obligations required the retention of records for a minimum period of three years at DSL requirements, monitored on an ongoing basis through periodic compliance reviews, and security incident reporting with Mainland regulations prescribes stricter timelines; media organizations shall further enforce secondary use restrictions, particularly in AI training which, for all intents and purposes, shall mean the Generative AI Services Management Measures in Mainland China where data not rightfully obtained cannot be used for model training.

4.4. Regulatory Gaps and Inconsistencies

The lack of clear definitions on what constitutes "important data" in media content introduces vagueness hence creates uncertainties, more precisely; for news content. Practitioners in the industry report that they have always experienced divergent interpretations in the course of seeking guidance from the regulators. For example, some regulators treat all forms of political reporting as "important data," whereas others prefer less inclusive definitions. Inconsistencies make the whole of compliance more complex and, therefore, operational risks on media organizations that are handling cross-boundary data.

Hong Kong prefers remedial actions to penal actions, a practice entirely opposite to mainland China which resorts to immediate administrative sanctions in the case of first violations. Effective compliance strategies must be bifurcated by these differences and based on divergent expectations in enforcement practices.

Efforts on harmonization have been put together to address this. Among the initiatives is the cross-boundary data classification standard for media content from the Greater Bay Area Data Governance Working Group. Another is "Compliance Framework for Cross-Boundary Content Exchange," led by the GBA Media Alliance. An initiative towards this end is the Hong Kong-Mainland Cross-

boundary Data Governance Liaison Office. While these are the few harmonization efforts available, the basic constitutional variation on information governance leads one to believe that alignment in regulations will not be feasible soon. Media organizations, therefore, must maintain compliant sophistication at an increasingly complex evolving system of regulation while having cross-boundary operations.

5. Industry Response and Future Outlook for Cross-Boundary Media Data Flows

5.1. Current Industry Adaptation Strategies

Media organizations working across the boundary also have very sophisticated tactics for adaptations to the ever-gearing regulatory environment, such as the use of the dual-region architecture for the likes of the leading organization like TVB with the production environments physically separated but connected through secure API gateways, and Phoenix Media, which is a real pioneer of compliance-aware microservices that have the regulatory requirements encoded directly into the service definitions.

Adjustments in business models involve the establishment of cross-border compliance subsidiaries, such as the "Greater Bay Area Content Exchange Platform" of China Media Group through which content goes through the appropriate structured intermediaries in a flow structure between jurisdictions. Other firms such as South China Morning Post opt for selective separation strategies, keeping segregated operations for sensitive content, with systems integrated for the less regulated type of content.

Content strategies have also evaded with the "dual-track editorial" model of Caixin Global working on a single creation with jurisdiction-specific review stages. Hong Kong Cable Television's governance framework for AI-written content has different review processes not only based on creation location but also based on the destination of distribution, thereby technically enforcing with mechanisms that restrict capabilities of the model in that regard.

5.2. Future Trajectories and Policy Recommendations

The major obstacle for cross-border media operations continues to be regulatory ambiguity - especially about what constitutes "important data" in a media context. With pushes from market access reasons challenges notwithstanding further investment to comply with 78% of media executives say that it is very important to create a Seamlessly Deliverable cross-border piece of content for growth.

Emerging privacy-enhancing technology solutions are making inroads to facilitate collaborative AI development without the direct transfer of data. Simultaneously, developing content ecosystems imply a growing integration of user-generated and professional content across boundaries—if decent moderation approaches can be ensured—while ensuring increased reach with an audience.

Policy suggestions to fuel sustainable development should have guidance for industry in media content classification, regulatory sandboxes cross-border technologies; harmonized compliance certification programs; training programs for compliance professionals; and support for Compliance Technology from the government.

Regulation of cross-border media activities will be driven by technological advancement, market dynamics, and regulatory change. Companies that manage to combine the need for compliance with advancing operational efficiency shall capitalize on those integration opportunities. Targeted policy initiatives can clarify regulatory ambiguities while supporting responsible innovation.

6. Conclusion

This study shall provide an in-depth analysis of the nexus between technology, regulation, and industrial practices of cross-border media data flows between Hong Kong and mainland China. In

technical terms, the AI implementation in cross-border media operations would indicate advanced approaches to compliance-aware architecture taken by the same company through region-specific infrastructure configurations that make it possible to conduct business in these contrasting regulatory environments. Comparative legal analysis brings out key contrasts in the constitutional approach toward information governance, which are further underlined by the emerging harmonization tendencies within the Greater Bay Area initiatives.

The industry variants play pragmatic responses to those challenges. Organizations carry out differentiated technological architectures, business models, and content strategies appropriately through a risk assessment and market prioritization. Sustainable development of cross-border media operations can be achieved by technological as well as regulatory changes-in particular through the clarification of definitional ambiguities and the development of compliance mechanisms specialized for media contexts.

Full regulatory alignment is not feasible in the short term, but evolving technical solutions combined with specific policy interventions can help develop a more integrated media ecosystem about innovation and compliance. The development of this kind of experience by media organizations in the labyrinthine landscapes of regulation has shown that embedded compliance by design is the more sustainable path, rather than solutions retrofitted after the fact to complex regulatory environments.

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