

Theoretical differences and optimization approaches of personal information and data element regulation

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Abstract: The rapid development of the digital era has fostered a dual-structured legal framework governing data elements and personal information regulation. While this system provides foundational safeguards for digital economic growth, it still exhibits structural flaws and institutional shortcomings. Through systematic analysis of the Civil Code, Data Security Law, and Personal Information Protection Law, this study examines theoretical conflicts between "technological ontology" and "contextual relevance theory," as well as standard debates between "identifiability core theory" and "sensitivity classification theory." The research reveals issues in existing theoretical paradigms, including conceptual abstraction, static identification limitations, and unclear weight distribution among multiple elements. To address these theoretical and practical challenges, the study proposes an integrated solution combining legal regulation, technological governance, and ethical constraints: establishing authoritative interpretations to clarify statutory differentiation criteria; creating a cross-border data circulation certification system that balances security and efficiency; facilitating precise translation of legal norms into technical standards; and building a multi-stakeholder industry ethics framework. This systematic governance model aims to break down conceptual dichotomies, achieve dynamic equilibrium between data value realization and personal information protection, and provide a Chinese-characteristic institutional paradigm for digital social governance.

Key words: Value of data elements; personal information rights and interests; integration of regulatory system; three-dimensional linkage governance; value balance

1. Introduction

The technological innovations of the digital era are reshaping modern society's operational models at an unprecedented pace[1]. As emerging production factors, data resources and identity-related information have transcended traditional economic boundaries, playing a structural supporting role in enhancing government governance efficiency and optimizing public service systems[2]. Behind this technological empowerment lies a latent conflict between privacy protection and data utilization, forming a core issue that must be directly addressed in building digital civilization[3].

However, "theoretical disputes at the conceptual level have long plagued both academia and practitioners." While "mechanically recorded numerical symbols possess only objective documentation functions when detached from specific personal elements," these symbols transform into legally protected personal information when combined with identifiable individual characteristics[4]. This conversion mechanism has sparked cognitive

disagreements in data desensitization technology applications: Does removing explicit identifiers retain the attribute of personality rights? Can complete anonymization technology completely eliminate the rights association of information subjects? Theoretical ambiguity not only constrains the depth of academic research but also causes confusion in legal application standards during judicial practice[5]. In practice, the current legal framework reveals systemic flaws when addressing emerging challenges[6]. Although national legislatures have established foundational regulatory systems for data and personal information protection, their effectiveness is constrained by multiple factors —such as technological advancements outpacing legal revisions (particularly the direct impact of blockchain distributed ledger technology on traditional regulatory models), gaps in interdepartmental legal coordination leading to jurisdictional conflicts in cross-border data flows, and imbalanced law enforcement resource allocation coupled with weak public rights awareness —all of which further undermine the intended effectiveness of institutional design[7][8].

Building a scientific and systematic protection framework requires multidimensional collaborative efforts[9]. This paper explores the theoretical boundaries of data and personal information protection along with institutional optimization[10]. First, through analyzing China's current legislative landscape, it reveals shortcomings in the country's legislation regulating personal information and data elements[11]. Second, by examining academic disagreements, the paper critiques existing theories and proposes the logical framework for regulating personal information and data elements. Building on this foundation, the text further discusses institutional optimization strategies for these regulatory aspects.

2. The dual structure in Chinese legislation and its reasons

To ensure the empirical foundation of this study, we systematically review and evaluate China's Civil Code, Data Security Law, and Personal Information Protection Law[12]. The Civil Code incorporates personal information into personality rights protection, establishing a framework for safeguarding information subjects' rights[13]. However, it faces challenges including weak operational feasibility, ambiguous property attribute handling, limited remedial mechanisms, and conceptual confusion. The Data Security Law constructs a data governance framework from a macro perspective, emphasizing both security and development. Yet its classification standards remain abstract, lack clear review mechanisms, and adopt overly broad principles for promotion measures, potentially stifling data innovation. The Personal Information Protection Law improves the coordination mechanism between personal information protection and data regulation. Nevertheless, its informed consent mechanism remains idealistic, lacks adequate provisions for personal information portability, fails to address boundary issues with insufficient precision, requires refinement in law enforcement and supervision systems, and demonstrates limited regulatory strength for emerging topics like algorithmic recommendations.

3. Theoretical speculation on personal information and data

In the theoretical debate about data and personal information, we confront fundamental disagreements in conceptual definitions. The technological ontology views data as a product of technology, emphasizing its value neutrality while overlooking ethical and legal attributes, leading to unclear data ownership. Conversely, contextual relevance theory emphasizes data's social embeddedness, considering it a digital

representation of human activities and advocating for redefining data attributes within a digital ethics framework. However, both theories have limitations: the technological ontology oversimplifies data's social dimensions, while the contextual relevance theory lacks practical applicability.

The core debate surrounding identification criteria revolves around defining personal information. The core theory of identifiability relies on individual traceability, yet technological advancements have blurred identity recognition boundaries. The sensitivity grading approach attempts to establish a protection gradient based on information importance, but lacks objective standards and overlooks contextual processing scenarios and risk factors. The integrated judgment framework proposes a multidimensional evaluation system, though its operational complexity hinders stable decision-making. Methodological critics argue that data classification involves not only technical challenges but also social power dynamics, yet lack concrete implementation pathways.

Critical reflection on research methodologies has exposed current limitations. Concept-driven studies, lacking empirical grounding, face growing skepticism. While case-based approaches help bridge the gap between theory and practice, their systematic frameworks remain underdeveloped[14]. As practical propositions, data classification systems must address both the actual effectiveness of technological applications and their societal impacts. Moreover, the closed nature of regional research paradigms continues to draw criticism.

In conclusion, the regulatory approaches for personal information and data elements require innovative perspectives. Future research should systematically analyze the essential characteristics of data elements and personal information, precisely align with existing regulatory frameworks, and optimize legal governance. Within the context of globalization, it is crucial to establish a cross-jurisdictional comparative analysis framework to distill universal rules[15]. Simultaneously, technical governance and ethical constraints must work in tandem to ensure the effectiveness and adaptability of regulations governing data elements and personal information.

4. Optimization approaches for regulation of data elements and personal information

When establishing a classification framework for digital resources and personal privacy information in China, it is essential to thoroughly analyze their fundamental

characteristics and integrate multidimensional perspectives encompassing socio-economic development patterns, legal infrastructure, and global digital governance dynamics[16]. Digital resources, as value-neutral and diverse structured information carriers, primarily serve to reveal societal operational principles through systematic integration and intelligent analysis. In contrast, personal privacy information focuses on identifying individual identities, with its core mission being to safeguard citizens' private spaces and personal dignity. The inherent differences between these two information forms determine distinct regulatory approaches[17]. However, the deep integration of digital technologies has increasingly blurred the boundaries between personal information and data elements, necessitating the creation of a unified yet differentiated regulatory framework that achieves coordinated development between personal information protection and data value realization.

In the process of constructing theoretical paradigms, we must confront the practical contradictions inherent in building a Digital China. The deep integration of artificial intelligence and cloud computing has transformed digital resources into core drivers for industrial upgrading, social governance innovation, and public service optimization[18]. However, privacy breaches stemming from massive data collection and commercialization have exposed structural conflicts between efficient data circulation and citizen rights protection. This dual nature demands that classification standard developers balance maintaining the fluidity of digital economy production factors with strengthening institutional safeguards for personal privacy. Through dynamic equilibrium mechanisms, they should achieve coordinated development between technological dividends and rights protection.

In practical implementation, mechanisms balancing personal information and data elements should focus on key dimensions: establishing a data classification and grading system, improving data desensitization and anonymization mechanisms, and building informed consent and rights-sharing frameworks. Effective operation of these mechanisms requires multidimensional coordination of legal regulation, technological governance, and ethical constraints to form systematic institutional solutions. The precise alignment with existing regulatory frameworks and optimization of legal governance demand legislative improvements that accurately connect with current normative structures, progressing from conceptual

clarification to systemic coordination to establish a multi-tiered regulatory framework. While the Civil Code, Data Security Law, and Personal Information Protection Law have formed the foundational legal architecture, there remains a regulatory vacuum in data ownership rules and circulation mechanisms. There is an urgent need to refine classification standards at the level of legal interpretation, clarify the rights and obligations boundaries between data holders, processing institutions, and information subjects, and build a system that both unleashes the value of data elements and prevents privacy leakage risks.

In the context of globalization, institutional alignment requires that system design must balance international standard compliance with preservation of local characteristics. Confronted with the EU's General Data Protection Regulation (GDPR)-led trend of strict protectionism and APEC's cross-border privacy framework advocating data flow facilitation, China, as a major digital economy player, needs to actively engage in international rule dialogues while upholding data sovereignty principles. The coordinated development of technological governance and ethical constraints emphasizes that technical governance serves as a critical dimension for defining data and personal information. Through technological means, we can enhance data security levels while promoting data value realization. Technological governance advancement should adopt a model combining government guidance, market leadership, and multi-stakeholder participation. Ethical constraints, serving as an essential supplement to legal regulation and technological governance, play an irreplaceable role in data governance systems. The primary task is to establish industry-specific ethical frameworks, formulating differentiated ethical guidelines tailored to the unique characteristics and risk profiles of data processing across various sectors and fields, thereby clarifying both the value boundaries and ethical bottom lines of data handling.

5. Conclusion

The deep integration of data elements and personal information regulation should not be oversimplified into static binary oppositions, but rather recognized as a systematic governance paradigm characterized by dynamic equilibrium. By accurately grasping the essential features of information, combined with legal system development, international trends, and technological advancements, this paper constructs a regulatory framework that achieves dialectical unity between value activation of production factors and rights protection. This

three-dimensional collaborative governance model not only effectively addresses current theoretical disputes and practical challenges in defining data and personal information, but also provides a solid institutional foundation for the long-term development of digital society. Through coordinated efforts in normative guidance, technological empowerment, and ethical orientation, we can establish a modern governance system that stimulates innovation vitality in the digital economy while safeguarding citizens' digital rights, thereby advancing the construction of Digital China to higher levels. Against the backdrop of profound transformations in global digital governance frameworks, this integrated governance model demonstrates China's innovative thinking on cultivating data element markets and protecting personal information rights, offering a Chinese solution that balances efficiency and equity, security and development for global data governance. By actively participating in international rule-making, China can promote the establishment of a more open, inclusive, and shared new global digital governance order, fostering harmonious unity between technological progress and human welfare.

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