HO CHI MINH NATIONAL ACADEMY OF POLITICS

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BUILDING A LEGAL FRAMEWORK FOR THE DEVELOPMENT AND APPLICATION OF ARTIFICIAL INTELLIGENCE IN VIETNAM

SUMMARY OF THE DOCTORAL THESIS

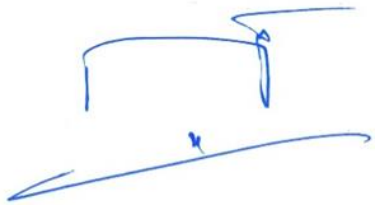
MAJOR: THEORY AND HISTORY OF STATE AND LAW

Code: 9380106

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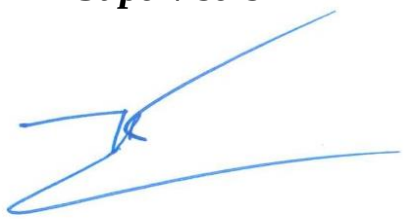
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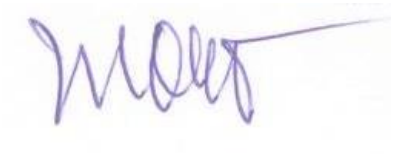


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Publishers Association of Vietnam

The thesis was defended in front of the Thesis Committee at Academy Level at the Ho Chi Minh National Academy of Politics
At 14:30 on 11 October 2026

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INTRODUCTION

1. The necessity of the thesis

From a practical perspective, Artificial intelligence (AI) is reshaping the economies, societies, and legal systems of nations at a rapid pace and with an increasingly broad scope of impact. The global AI market is projected to grow by 38.1% annually, from $93.5 billion in 2021 to approximately $1,111.8 billion by 2030. From medical diagnosis, credit decisions, traffic management, education, and e-commerce to the control of critical national infrastructure, AI is gradually penetrating many areas of social life. However, along with these opportunities, AI also raises many complex legal issues, such as liability when an AI system causes harm; the protection of personal data; algorithmic transparency and accountability; controlling bias and discrimination; protecting intellectual property rights (IPR); ensuring cybersecurity and safety; protecting consumers; and safeguarding human rights and citizens' rights in the digital environment. Therefore, the development and application of AI are not merely technical or economic issues, but also institutional and legal matters of particular importance. From a legal perspective, the international community has entered a phase of establishing and refining AI governance frameworks. A common feature of these models is their effort to strike a balance between two objectives: promoting innovation and developing the AI market, while simultaneously preventing and controlling risks to people, society, and the rule of law.

In line with global trends, from a political perspective, the Communist Party and the Government of Vietnam recognized the strategic importance of AI early on and set out requirements to improve the relevant institutional and legal frameworks. The practical experience of AI development in Vietnam shows that the need to improve the legal framework is becoming increasingly clear. In 2025, Vietnam ranked 45th globally and 9th in East Asia in terms of AI development and application; Vietnam's average score on the AI Readiness Index was 59.98, higher than the regional average of 50.32. In light of this reality, the enactment of the 2025 Artificial Intelligence Law, Decree No. 142/2026/NĐ-CP guiding the implementation of the 2025 Artificial Intelligence Law, and Decision No. 33/2026/QĐ-TTg, which establishes a list of high-risk AI systems, demonstrate Vietnam's proactive approach to establishing a legal framework for a new technology with far-reaching implications.

From a theoretical perspective, the issue at hand is not merely to describe existing legal provisions on AI, but to clarify the theoretical foundation, structure, content, and methodology for building an appropriate legal framework for the development and application of AI in Vietnam. Based on the identification of gaps in previously published related works, this dissertation identifies four specific theoretical areas aimed at supplementing and developing a systematic framework: expanding the sources of law (first) to provide the foundation for restructuring the

regulatory mechanism (second); the new regulatory mechanism requires a corresponding legislative process (third); all three of these areas must be situated within the framework of the rule of law to ensure the legitimacy and long-term sustainability of the legal framework being established (fourth).

Based on the above reasons, the doctoral candidate has chosen the topic "Building a Legal Framework for the Development and Application of Artificial Intelligence in Vietnam" as the subject of the doctoral dissertation in law, specializing in the Theory and History of State and Law.

2. Research purpose and research tasks of the thesis

2.1. Research purpose

The purpose of this dissertation is to establish a comprehensive scientific theoretical foundation for the legal framework and to build a legal framework for the development and application of AI; thereby assessing the current situation and proposing a system of feasible solutions to build and refine a comprehensive, effective, and sustainable legal framework in Vietnam.

2.2. Research tasks

To achieve the above objective, this dissertation undertakes the following tasks:

First, to provide an overview of domestic and international research related to the topic; to identify the foundational theories, scientific hypotheses, and research questions that guide the entire dissertation.

Second, clarify the theoretical foundation of the topic, including the system of core concepts; the architectural model of the legal framework for AI development and application; the stages and techniques of its development; the principles, criteria, and conditions for ensuring its effectiveness; and analyze international experiences with specific reference value for Vietnam.

Third, analyze and evaluate the current status of AI development and application; the current state of the legal framework; and the current status of building a legal framework for AI development and application in Vietnam; use typical case studies to provide evidence supporting empirical verification and identify the causes of existing limitations.

Fourth, identify guiding principles and propose a systematic set of solutions to improve the legal framework and enhance the quality of efforts to build a legal framework for the development and application of AI in Vietnam.

3. Research subject and research scope of the thesis

3.1. Research subject

The subject of this dissertation is the building of a legal framework for the development and application of AI in Vietnam and the product of that activity is the legal framework for the development and application of AI as well as the relationship with the practice of development and application of AI that needs to be adjusted.

3.2. Research scope

- Research Content: The dissertation examines three main areas: (i) the theoretical foundation of legal frameworks and the building of a legal framework for the development and application of AI (concepts, characteristics, roles, content, principles, criteria, and ensuring conditions); (ii) international experiences in building a legal framework for the development and application of AI; (iii) the current status and solutions for building a legal framework for the development and application of AI in Vietnam.

- Research scope: The thesis focuses on the legal framework and the current status of building a legal framework for the development and application of AI in Vietnam.

- Regarding the time frame of the research: The dissertation analyzes documents and data focusing on the 2017-2026 period.

4. Theoretical basis and research methodology

4.1. Theoretical basis

The dissertation is conducted based on the Marxist-Leninist methodology of dialectical materialism and historical materialism. In addition, the dissertation applies the following specialized theories: the theory of legal regulation and risk governance proposed by Julia Black; the theory of adaptive governance developed by Carl Folke; and the human rights-based approach proposed by several agencies within the United Nations system.

4.2. Research methodology

This dissertation combines the following research methods:

Analytical methods are used throughout the entire dissertation to clarify the meaning of each core concept, each component of the legal framework model, the current status at each level, and each development technique.

The synthesis method is widely used in reviewing relevant scientific literature, theoretical issues, the current status of the legal framework, as well as the building of a legal framework for AI development and application.

The comparative legal method is primarily used in analyzing international standards and experiences.

The historical method is used to analyze the process of building the legal framework for AI development and application in Vietnam during the 2017-2026 period and to provide an overview of the research.

The systems approach is applied to analyze the legal framework for the development and application of AI as a system with intrinsically related components, distinctive characteristics, and feedback mechanisms.

The case study method is used to examine a typical case involving the wave of deepfake fraud and the interdisciplinary legal response in Vietnam during the 2023-2025 period.

The expert interview method with 15 experts, categorized into four key professional fields, was conducted between February and May 2026 to collect practical insights not available in secondary sources, supplementing and validating the textual analysis.

5. New academic contributions of the thesis

First, theoretical contributions: The dissertation helps clarify the system of basic concepts related to "building a legal framework for the development and application of AI"; it applies several specialized theories to construct an analytical framework appropriate for the topic.

Second, contributions regarding the analytical framework and methodology: The dissertation establishes a four-dimensional analytical framework for the process of building a legal framework for the development and application of AI (actors, content, processes, and techniques).

Third, contributions from the assessment of the current situation: the dissertation identifies the degree of imbalance in the legal framework architecture for the development and application of AI in Vietnam; identifies three systemic causes explaining the limitations in legal framework building; uncovers gaps in the building process, and the direct causal mechanisms linked to deficiencies in the legal framework output.

Fourth, contributions in the form of practical recommendations: the dissertation particularly emphasizes solutions: a centrally coordinated, adaptive, tiered architectural model; VN-AI Verify; the 12-month streamlined TCVN AI system; the AI legislative drafting toolkit; the Supreme People's Court's proactive AI case law development program; the AI Management Information System (AMIS).

6. Theoretical and practical significance of the thesis

6.1. Theoretical significance

This dissertation contributes to legal science in four areas: developing a theoretical framework on the sources of law in the context of AI; developing a theoretical framework on technology-based lawmaking; contributing to the theory of the state and law; and developing a comparative legal research methodology on AI.

6.2. Practical significance

The research findings of this dissertation provide practical tools for government agencies and businesses; they also serve as a reference for research, teaching, and learning at law schools and related disciplines nationwide.

7. Structure of the thesis

In addition to the introduction, conclusion, a list of the author's previously published scientific works related to the thesis, a bibliography, and appendices, the thesis is structured into 4 chapters and 12 sections.

Chapter 1
OVERVIEW OF RELATED RESEARCH ON THE THESIS TOPIC

1.1. RESEARCH ON ARTIFICIAL INTELLIGENCE AND THE DEVELOPMENT AND APPLICATIONS OF ARTIFICIAL INTELLIGENCE

1.1.1. Research on Artificial Intelligence

First, regarding the concepts, history of development, principles, and basic applications of AI. Internationally, notable authors include Nils J. Nilsson, Stuart J. Russell, Peter Norvig, Jeff Heaton, Milo Foster, Max Tegmark, Kai-Fu Lee, Rex Martinez, Pei Wang, Kok-Lim Alvin Yau, and Sitki Selim Dolanay. In Vietnam, notable works include those by Nguyen Thanh Thuy, Tran Minh Tuan, Nguyen Duc Thuy, and Tran Minh Tam.

Second, regarding the nature, characteristics, and challenges of AI from social-legal, ethical, and governance perspectives, the most influential authors include Luciano Floridi, Stuart Russell, Tishby and Schwartz-Ziv, Doshi-Velez and Kim, Ribeiro, Singh, and Guestrin.

Third, regarding the socioeconomic impacts of AI, the most notable contributors are Acemoglu and Restrepo, Bughin, Köchling and Wehner, and Taddeo.

Fourth, regarding AI agents and agentic AI, notable contributors include Yao, Park, the OECD, and Sapkota.

1.1.2. Research on the Development and Application of Artificial Intelligence

First, notable international researchers include Everett M. Rogers, Tornatzky, Fleischer and Chakrabarti, Venkatesh, Bernard Marr and Matt Ward, Deloitte, Stanford, and Marly van Assen.

Second, articles published in specialized journals in Vietnam reflect the expansion of AI across many fields. Several reports have provided a broader overview of AI development and application, such as the 2025 Annual Report on AI in Vietnam; the 2025 Report on Vietnam's AI Economy; the "AI for Business: APAC Trends in AI Platform Adoption" report; reports from the Institute for Policy and Media Development (IPS); and the 2024 Report on Cybersecurity in Vietnam.

1.2. STUDIES ON THE LEGAL FRAMEWORK FOR THE DEVELOPMENT AND APPLICATION OF ARTIFICIAL INTELLIGENCE

1.2.1. Studies on the Scope and Limits of the Legal Framework

International research on the meaning of the "legal framework" can be divided into three schools of thought: the narrow one of H.L.A. Hart, the broad one represented by Julia Black and Colin Scott, and the intermediate one of Brownsword, Scotford, and Yeung.

The theory about the relationship between hard law and soft law originates from Abbott's research in international law and Töller's research in the field of AI.

About technical standards, Majone's work on "regulation through standardization" is the most important theoretical foundation.

1.2.2. Studies on the Theoretical Foundations of the Legal Framework for Artificial Intelligence

Internationally, see Roger Brownsword and Morag Goodwin; Ryan Calo; Matthew U. Scherer; Bart Custers and Eduard Fosch-Villaronga; Marwala and Mpedi; and Nathalie A. Smuha. In Vietnam, notable examples include the Ministry-level research project on "Improving the Institutional Framework for Science and Technology Development in Vietnam in the New Context" and the article "A Legal Framework for Achieving Digital Transformation Goals in the Context of Vietnam's Rise".

1.2.3. Studies on Comparative Analysis of Artificial Intelligence Legal Framework Models

At the global governance level, notable contributors include Allan Dafoe, Erdélyi, and Goldsmith; Gasser and Almeida. Regarding the European model, see Veale and Zuiderveen Borgesius, as well as Wachter, Mittelstadt, and Russell.

1.2.4. Studies analyzing the legal frameworks for artificial intelligence in specific countries

For China, see Huw Roberts et al. in "The Chinese Approach to Artificial Intelligence: An Analysis of Policy, Ethics, and Regulation", Yang and Huang in "Quantitative Mapping of the Evolution of AI Policy Distribution, Targets, and Focuses over Three Decades in China" and Bai Xinsheng's "China's Plan to Become a World Leader in Artificial Intelligence". For the European Union, see Veale and Zuiderveen Borgesius in "Demystifying the Draft EU Artificial Intelligence Act" and Smuha in "From a 'Race to AI' to a 'Race to AI Regulation': Regulatory Competition for Artificial Intelligence". For the United Kingdom, see Drake et al. in "Legal Contestation of Artificial Intelligence-Related Decision-Making in the United Kingdom: Reflections for Policy" and Roberts et al. in "Artificial Intelligence Regulation in the United Kingdom: A Path to Good Governance and Global Leadership?".

In Vietnam, notable articles include "U.S. Legal Policies on Artificial Intelligence Development and Lessons for Vietnam"; "Japan's Current Strategy for Artificial Intelligence Technology Development"; "Understanding the Impacts of Artificial Intelligence on the European Union's Patent Law"; "Strategies for Establishing AI Ethics in the Federal Republic of Germany and Some Implications for Vietnam".

1.2.5. Works on Specific Legal Issues Related to Artificial Intelligence

Internationally, the issues of legal status and liability regarding AI have been addressed by scholars such as Lawrence B. Solum, Claudio Novelli, and Ryan Abbott. Regarding intellectual property, Daniel J. Gervais systematically analyzes the

possibility of copyright protection for works created by AI. On human rights, ethics, and international law, see Themistoklis Tzimas and Amir Rabet Ghannadi. On algorithmic fairness, transparency, and anti-discrimination, see Andrew D. Selbst and Cath Corinne. On the public sector and automated decision-making, refer to the European Law Institute's "Model Rules on Impact Assessment of Algorithmic Decision-Making Systems Used by Public Administration".

In Vietnam, read the reference book "Artificial Intelligence, Law, and Human Rights", co-edited by Nguyen Thi Que Anh, Vu Cong Giao, and Mai Van Thang; the monograph "Responsible Development of Artificial Intelligence: An Ethical, Social, and Legal Approach", co-edited by Nguyen Thi Que Anh and Nguyen Bich Thao; the NAFOSTED research project "Vietnamese Law in the Face of Artificial Intelligence Development: Research, Evaluation, and Improvement"; and the ministerial-level research project "Legal Aspects of Artificial Intelligence in Vietnam: Theory and Practice".

Regarding technical standards, refer to the Ministry-level research projects on guidelines for AI risk management, governance of AI use within organizations, bias in AI systems and AI-assisted decision-making, and a framework for AI systems using machine learning.

In the field of intellectual property, notable works include the dissertation by Ho Thuy Ngoc and articles by Nguyen Thi Que Anh, Nguyen Ngoc Hong Duong, Nguyen Hai An et al., Dang Thai Binh and Nguyen Trong Luan, and Quach Anh Nguyet.

In the field of legal liability, notable contributions include articles by Chu Thi Thanh An and Pham Thi Hien; Do Giang Nam and Dao Trong Khoi; Nguyen Thi Hoa; Le Minh Hung and Nguyen Thien Tam; Nguyen Hoang Thai Hy and Nguyen Phuong An; Trinh Tien Viet; Vu Ngoc Dieu Linh; Quan Thien Hung; and Kim Thang Long.

In the areas of human rights, personal data, and public administration, the journal features a dissertation by Doan Van Nhat and Le Trang Thu Phuong; an article by Tran Kien and Ho Minh Thanh; and studies on ChatGPT, the legal profession, public service delivery, and government administration on AI platforms.

Additionally, articles examining AI from the perspectives of development strategy, ecosystem, and public administration include those by Nguyen Manh Quan, Nguyen Thanh Thuy and colleagues, Trinh Quang Vu and colleagues, Ha Quang Thuy and colleagues, Ho Dac Loc and Huynh Chau Duy, Nguyen Thi Thu Huong, Tran Anh Tu and Dinh Hai Dang, Nguyen Thanh Tung, Nguyen Thi Hao, and Nguyen Van Trong.

1.3. RESEARCH STUDIES ON BUILDING A LEGAL FRAMEWORK FOR THE DEVELOPMENT AND APPLICATION OF ARTIFICIAL INTELLIGENCE

1.3.1. Research studies on legislative development

At the international level, notable works include those by Baldwin, Cave, and Lodge in "Understanding Regulation: Theory, Strategy, and Practice"; and by Helen Xanthaki in "Drafting Legislation: Art and Technology of Rules for Regulation".

In Vietnam, the research paper by the Institute of Legal Sciences, Ministry of Justice, titled "Factors for Creating a High-Quality Legal Normative Document"; Nguyen Van Cuong's "The Stability of the Law - Perceptions, Practices, and Solutions for Innovating the Analysis of Legal Stability as a Key Requirement of the Rule of Law"; Thai Thi Tuyet Dung and colleagues in "Some Shortcomings in Legislative and Regulatory Drafting Techniques Based on Practical Examples in Vietnam"; Phung Thi Yen and Pham Bui Vi Thao in "Digital Transformation in Legislation and Law Enforcement: Artificial Intelligence and Open Data - Challenges and Opportunities".

1.3.2. Works on the Theory of Developing Technological Regulations

Internationally, notable works include those by Baldwin, Cave, and Lodge in "Understanding Regulation: Theory, Strategy, and Practice"; Black's works on "decentering regulation"; Renn in "Risk Governance: Coping with Uncertainty in a Complex World"; the research by Sabel and Zeitlin on experimental governance; Collingridge in "The Social Control of Technology"; Jasanoff's works on the co-creation of science, technology, and social order; and the research on multi-stakeholder AI governance by Ngai Lim and Danforn Lim.

In Vietnam, see Vo Khanh Vinh's works on legal policy, legal development strategies, and innovative approaches to lawmaking; and the works on sandboxes and controlled experiments in Vietnam by Chu Thi Hoa, Tran Quyet Thang, and Duong Van Quy.

1.3.3. Studies on Methodologies for Developing Specific Artificial Intelligence Regulations

First, regarding accountability, Doshi-Velez and colleagues, in "Accountability of AI under the Law: The Role of Explanation", propose "explanation" as a tool to enhance accountability in AI systems.

Regarding legal liability in human-robot interactions, a notable work is the book "Human-Robot Interaction in Law and Its Narratives".

At the corporate level, see Iris H.-Y. Chiu and Ernest W.K. Lim in "Managing Corporations' Risk in Adopting Artificial Intelligence: A Corporate Responsibility Paradigm". Another important approach is governance-by-design by Mulligan and Bamberger in "Saving Governance-by-Design"; Yeung and Lodge (eds.) in "Algorithmic Regulation"; algorithmic power by Citron and Frank Pasquale; and Hadfield and Clark in "Regulatory Markets: The Future of AI Governance".

In the European context, of particular note are Carlo Casonato and Giulia Olivato in "AI Regulation in Europe: Exploring the Artificial Intelligence Act".

At the institutional level, see Theodorou and Dignum in "Toward Ethical and Socio-legal Governance in AI"; Cihon, Maas, and Kemp in "Should Artificial Intelligence Governance Be Centralized? Design Lessons from History".

In Vietnam, several new short articles have begun to raise these issues: Tran Viet Dung in "Reflections on the Development of Ethical Norms in the Process of Drafting Artificial Intelligence Legislation"; and "Developing a Legal Framework for Artificial Intelligence: Experiences from Several Countries and Implications for Vietnam" by Dr. Thai Thi Tuyet Dung and colleagues.

1.4. COMMENTS, EVALUATION, AND ISSUES FOR FURTHER RESEARCH IN THIS THESIS

1.4.1. Comments and Evaluation

First, regarding the theoretical foundation for the legal framework and its development, existing studies lack a unified theoretical conceptual foundation.

Second, regarding international experience in developing an AI legal framework, international studies primarily stem from the context of major technology and legal hubs, lacking the perspective of developing countries.

Third, regarding the current status and solutions for developing Vietnam's AI legal framework, most studies have not addressed the overall architecture of the legal framework. The process of developing the AI legal framework has received little attention. Domestic studies have not comprehensively answered the question of what Vietnam needs to do next following the enactment of the 2025 AI Law.

1.4.2. Issues to Be Further Explored in This Dissertation

Based on the identification of the achievements and limitations of the current research landscape, this dissertation identifies the following issues for further study: developing a theoretical foundation for a legal framework for the development and application of AI based on a multi-tiered model; analyzing the current status of developing a legal framework for the development and application of AI in Vietnam according to new concepts; and proposing a system of solutions to improve the legal framework and establish a legal framework for the development and application of AI in Vietnam.

1.5. SCIENTIFIC HYPOTHESIS AND RESEARCH QUESTIONS

1.5.1. Scientific Hypothesis

The scientific hypothesis of this dissertation is: In the context of rapid AI development, cross-sectoral impacts, and the emergence of many unpredictable risks, establishing a legal framework for the development and application of AI in Vietnam can only be effective if approached as a multi-layered, adaptive, and risk-based institutional design process.

1.5.2. Research Questions

Based on the research objectives and scientific hypotheses of this dissertation, the overarching research question is: What model, process, and solutions should Vietnam adopt to establish a legal framework for the development and application of AI that both promotes innovation and socioeconomic development while effectively managing the legal, ethical, social, and human rights risks posed by AI?

Chapter 2
THEORETICAL FOUNDATIONS FOR BUILDING A LEGAL FRAMEWORK FOR THE DEVELOPMENT AND APPLICATION OF ARTIFICIAL INTELLIGENCE

2.1. CONCEPT, CHARACTERISTICS, ROLE, AND CONTENT OF BUILDING A LEGAL FRAMEWORK FOR THE DEVELOPMENT AND APPLICATION OF ARTIFICIAL INTELLIGENCE

2.1.1. Concepts, Characteristics, and Roles of Building a Legal Framework for the Development and Application of Artificial Intelligence

* *Concept*

A legal framework is a structured system comprising regulatory tools and institutions organized according to specific principles, with interrelated and mutually reinforcing elements, designed to regulate a specific area of social relations in order to achieve established objectives.

The legal framework for the development and application of AI is a structured system comprising regulatory tools and institutions organized according to specific principles, with interconnected and mutually reinforcing relationships, designed to regulate the activities of stakeholders throughout the entire lifecycle of AI systems. This framework serves to both promote innovation and socioeconomic development while protecting human rights, manage risks, and ensure the responsible development and application of AI.

Building a legal framework for the development and application of AI is a purposeful, multi-stakeholder, and continuous process. It involves designing an overall architecture, establishing its constituent components, organizing the relationships among these components, building enforcement capacity, and developing adaptive mechanisms to create a comprehensive, consistent, effective, and updatable regulatory system capable of adapting to changes in technical, economic, social, and legal conditions.

* *Characteristics*

- Co-creation with the technological development process.
- Multi-stakeholder nature and decentralized regulatory authority.
- High level of technical and legal complexity.

- The inherent multi-tiered nature of the development structure.
- Imperfection and uncertainty.

** Roles*

- Shaping and specifying public policy on AI.
- Refining the state management framework for AI.
- Mobilizing and organizing the participation of relevant stakeholders.
- Establishing a foundation for AI governance.

2.1.2. Content for Building a Legal Framework for the Development and Application of Artificial Intelligence

2.1.2.1. Entities Involved in Building the Legal Framework for the Development and Application of Artificial Intelligence

The first group consists of entities with decision-making authority, including the legislative, executive, and judicial branches.

The second group - official participants - includes legal review bodies; legislative oversight bodies; and agencies or organizations that issue technical standards or recognize codes of conduct.

The third group, entities that influence the process of establishing the legal framework, includes international intergovernmental organizations and multilateral cooperation mechanisms; international and regional technical standardization organizations; networks of independent experts and transnational academic communities; and technology companies with market-leading positions.

2.1.2.2. Content of Activities to Build a Legal Framework for the Development and Application of Artificial Intelligence

The development of a legal framework for the advancement and application of AI encompasses several components: a layered architectural structure for the framework; regulatory principles and approaches; sandboxes; a system of rights and obligations for relevant stakeholders; mechanisms for ensuring compliance and addressing adverse consequences; and procedures for periodic review and updates.

2.1.2.3. Process for Building a Legal Framework for the Development and Application of Artificial Intelligence

This process consists of four basic stages: diagnosing the need for adjustment; designing the overall architecture; establishing the components; and operating, evaluating, and adapting the framework.

2.1.2.4. Techniques for Building a Legal Framework for the Development and Application of Artificial Intelligence

The first technique, Regulatory Impact Analysis (RIA), is a systematic analytical process designed to assess the consequences of policy options before enacting legislation.

The second technique involves defining core functions for rapidly evolving technologies, thereby avoiding the limitations of exhaustive lists and allowing legal texts to self-expand to cover future technologies without the need for amendments.

The third technique is flexible delegation: a stable framework law delegates authority to decrees to update technical requirements, and those decrees, in turn, delegate authority to standards to update technical details.

The fourth technique involves allocating obligations based on position in the value chain, shifting from fault-based allocation to allocation based on control and benefit.

The fifth technique involves proportional exemptions to adjust the method of demonstrating compliance.

The sixth technique involves codifying technical standards, which transforms the advantages of standards into a legally binding regulatory framework.

2.2. PRINCIPLES, EVALUATION CRITERIA, AND CONDITIONS FOR BUILDING A LEGAL FRAMEWORK FOR THE DEVELOPMENT AND APPLICATION OF ARTIFICIAL INTELLIGENCE

2.2.1. Principles for Building a Legal Framework for the Development and Application of Artificial Intelligence

- The principle of placing human rights at the center requires that, throughout the process of establishing the legal framework, the protection and promotion of human rights must be the overriding objective.

- The principle of proportionality between regulatory measures and the level of risk requires that the degree of legal oversight be commensurate with the actual risk posed by each type of AI, while simultaneously fostering innovation.

- The principle of selective international compatibility requires that the legal framework be built based on the international context while safeguarding national interests.

- The principle of consistency and systemic coordination requires that the components of the legal framework be interconnected according to an internal logic.

- The principle of adaptability and learning from practice is integrated into the design from the outset and constitutes an ongoing institutionalization process.

2.2.2. Evaluation Criteria for Building a Legal Framework for the Development and Application of Artificial Intelligence

Criterion 1: Practical and Evidence-Based Approach

Criterion 2: Scientific rigor in architectural design

Criterion 3: Substantive and inclusive consultation

Criterion 4: Transparency and accountability of the process

Criterion 5: Sustainability and capacity for continuous improvement of the development process

The criteria for evaluating the outputs of the development process, specifically regarding the creation and application of AI, include: completeness and balance; consistency and coherence; appropriateness; feasibility; and adaptability.

2.2.3. Conditions for Building a Legal Framework for the Development and Application of Artificial Intelligence

Conditions Regarding Political Will and Strategic Direction

Conditions Regarding Institutional Capacity and Human Resources

Conditions Regarding Legal and Technical Infrastructure

Conditions Regarding Stakeholder Participation

Conditions regarding financial resources

2.3. INTERNATIONAL EXPERIENCE IN ESTABLISHING A LEGAL FRAMEWORK FOR THE DEVELOPMENT AND APPLICATION OF ARTIFICIAL INTELLIGENCE AND ITS REFERENCE VALUE FOR VIETNAM

The Impact of International Standards (United Nations, OECD, and the European Union) on Vietnam:

- Establishes a crucial foundation for defining the values, principles, and objectives of Vietnam's AI legal framework.

- Helps Vietnam ensure the compatibility of its national legal framework with the global legal and technological environment.

- Provides reference tools for Vietnam to build AI governance capacity.

- Sets requirements for localizing international standards into appropriate regulations, standards, institutions, and enforcement tools.

Lessons from the experiences of several countries (the United States, China, Japan, South Korea, and Singapore):

Firstly, regarding the entity responsible for developing the legal framework: a coordinating body located within the highest executive branch is more effective than one placed within a specialized ministry. The participation of the private sector and academia is most valuable when organized through formal processes.

Secondly, regarding the content of the legal framework: no international model has succeeded by focusing solely on a single type of content. Exemptions based on scale and adaptive mechanisms are indispensable components.

Thirdly, regarding the process of developing the legal framework: a diagnostic phase involving public evidence gathering prior to drafting yields dual benefits; drafting legal regulations in parallel with detailed guidance documents; and conducting in-depth technical consultations with a distinct structure.

Fourthly, regarding the techniques for developing a legal framework:

First, functional definitions offer significantly greater long-term stability than enumerative definitions of specific technologies.

Second, the presumption of compliance mechanism achieved through the codification of technical standards is the most effective technique.

Third, the technique of combining exemption thresholds with self-assessment tools significantly increases the incentive for voluntary compliance.

Fourth, the technique of using undated references is a low-cost yet highly effective legislative tool.

Based on the above reference points, a model of "adaptive, tiered architecture with central coordination" comprising seven basic tiers can be proposed for Vietnam.

Chapter 3
THE CURRENT STATE OF BUILDING A LEGAL FRAMEWORK FOR THE DEVELOPMENT AND APPLICATION OF ARTIFICIAL INTELLIGENCE IN VIETNAM

3.1. CURRENT STATUS OF THE LEGAL FRAMEWORK FOR THE DEVELOPMENT AND APPLICATION OF ARTIFICIAL INTELLIGENCE IN VIETNAM

3.1.1. Current Status of the Development and Application of Artificial Intelligence in Vietnam

First, research and development (R&D)

Second, data collection and processing

Third, model building and training

Fourth, testing and evaluation

Fifth, integration and deployment

Sixth, management and maintenance

Seventh, end-user application development

Eighth, end-of-life

3.1.2. Current Status of the Legal Framework for the Development and Application of Artificial Intelligence in Vietnam

3.1.2.1. First Tier - Constitutional Foundations and International Instruments

3.1.2.2. Second Tier - Specific and Related Legal Regulations

3.1.2.3. Third Tier - Legally Binding Technical Standards

3.1.2.4. Fourth Tier - Soft Law and Industry Guidelines

3.1.2.5. Fifth Tier - Codes of Conduct and Industry Self-Regulation

3.1.2.6. Sixth Tier - Case Law, Principles of Equity, and Legal Customs

3.1.2.7. Seventh Tier - Enforcement Institutions and Oversight Mechanisms

The relationship among the seven tiers of the legal framework is a network of mutual interactions, centered on bidirectional dependencies and feedback loops.

In summary, the legal framework meets the minimum requirements across all five criteria. However, it does not fully satisfy these criteria, specifically regarding completeness and balance. Three foundational layers (Layer 1, Layer 2, and Layer 7) reach at least the minimum threshold, with Layer 2 approaching a level of basic completeness. Since Layers 5 and 6 are currently absent, the legal framework remains incomplete and unbalanced. This imbalance stems from the fact that the layers upon

which others depend - namely, the standards layer and the institutional layer - are the least developed.

3.2. CURRENT STATUS OF EFFORTS TO BUILD A LEGAL FRAMEWORK FOR THE DEVELOPMENT AND APPLICATION OF ARTIFICIAL INTELLIGENCE IN VIETNAM

3.2.1. On the entities responsible for building the legal framework for the development and application of artificial intelligence in Vietnam

3.2.1.1. Entities with decision-making authority

The National Assembly has met its timeline by passing the 2025 AI Law, the 2025 Digital Technology Industry Law, the 2025 Personal Data Protection Law, and the 2025 Law on the Issuance of Legal Documents. The Ministry of Science and Technology has been designated as the lead agency. No court precedents related to AI have been published.

3.2.1.2. Official participants

The Ministry of Justice has fulfilled its review functions appropriately. The National Committee for Standards, Metrology, and Quality has issued 8 foundational TCVN standards.

3.2.1.3. Groups Influencing the Legal Framework Development Process

First, the incorporation of influences from international intergovernmental organizations has primarily remained at the level of general principles; there is no evidence that these recommendations have been systematically interpreted and translated into specific regulatory provisions.

Second, the influence of international and regional technical standardization organizations remains very limited compared to their potential.

Third, there is no formal mechanism linking academic research to legislative drafting activities.

Fourth, the influence of large, market-leading technology companies risks creating representational asymmetry in the consultation process.

3.2.2. On the Content of Building a Legal Framework for the Development and Application of Artificial Intelligence in Vietnam

First, the practice of buiding Vietnam’s AI legal framework shows that purposeful architectural design is virtually nonexistent in the form of a documented process.

Second, Vietnam has made significant progress, moving from the issuance of strategic guidelines to the institutionalization of a modern governance methodology aligned with international standards.

Third, the design and operation of controlled policy testing mechanisms in Vietnam are currently transitioning from a sector-specific pilot model to broad-scale institutionalization.

Fourth, the development process has led to the decision to simultaneously use multiple types of compliance assurance tools.

Fifth, post-enactment monitoring and periodic reviews are the newest components currently taking shape in Vietnam's AI governance cycle.

3.2.3. On the Process of Building a Legal Framework for the Development and Application of Artificial Intelligence in Vietnam

The four-stage progression features distinct characteristics and focal points, ranging from the recognition of AI as a technological priority to the completion of a foundational legal and regulatory framework - a process spanning nearly a decade. Each stage includes a breakthrough milestone that paves the way for the subsequent phase.

3.2.4. On Techniques for Establishing a Legal Framework for the Development and Application of Artificial Intelligence in Vietnam

3.2.4.1. Technique 1 - RIA most clearly highlights the gap between formal and substantive compliance

3.2.4.2. Technique 2 - Functional definitions are best applied in line with international practices

3.2.4.3. Technique 3 - Flexible, tiered delegation achieves an average level, higher than most other techniques, but also harbors a notable inherent imbalance

3.2.4.4. Technique 4 - Defining obligations along the value chain most clearly illustrates the gap between principled understanding and operational details

3.2.4.5. Technique 5 - Proportional Exemptions remains weak and directly impacts the innovation capacity of Vietnam's AI ecosystem

3.2.4.6. Technique 6 - Codification of Standards shows the greatest divergence from international practices and is also the technique most dependent on preconditions outside the legal framework

3.2.5. Assessment of the Establishment of a Legal Framework for the Development and Application of Artificial Intelligence in Vietnam

Criterion 1: Practical and Evidence-Based Approach:

First, there was no official announcement regarding a Regulatory Impact Assessment (RIA) conducted prior to the drafting of the 2025 AI Law.

Second, there is no evidence that data from serious AI incidents was systematized and used as a basis for regulatory design.

Third, the 2025 AI Law shows a clear influence from the EU AI Act, but there is no documentation explaining why certain elements were selected from the EU rather than drawing lessons from South Korea or Singapore, despite their more similar contexts.

Criterion 2: The scientific approach to architectural design is well-directed and well-founded. However, there are at least three weaknesses: there is no official architectural documentation explaining the internal logic of the entire system; there is no gap analysis identifying missing components of the legal framework; and there is no clear distinction between passive AI systems and AI agents.

Criterion 3: Substantive and inclusive consultation still has significant limitations: there is no public evidence of in-depth technical consultation; the voices of consumers and vulnerable groups affected by AI have not been heard; and there is no feedback report explaining the reasons for accepting or rejecting specific comments.

Criterion 4, transparency and accountability of the process in terms of legal compliance, meets the requirements of the 2025 Law on the Issuance of Legal Documents. However, certain elements in line with international standards are needed.

Criterion 5, sustainability and capacity for continuous improvement: The 2025 AI Law and Decree 142 still lack mandatory review provisions, as well as mechanisms for collecting, analyzing, and forecasting trends, signals, and potential fluctuations in the external environment, and a feedback loop from incident data to policy updates.

Regarding the conditions for establishing a legal framework, a preliminary assessment suggests the following: political will and strategic orientation are the strongest factors; institutional capacity and human resources are present, at least to a minimal extent; there is a misalignment between the legal infrastructure and the technical infrastructure; stakeholder participation is at a minimal level; and while there are strong macro-level commitments regarding financial resources, the specific allocation for institutional development remains unclear.

3.2.6. Causes of Limitations in Building the Legal Framework

A synthesis of the causes of limitations regarding the subjects, content, procedures, and technical aspects of building the legal framework serves as the direct theoretical basis for designing the system of solutions in Chapter 4.

3.2.7. Typical Scenario: Interdisciplinary Legal Response to the Wave of Deepfake Fraud

Description of the scenario regarding scale and scope from 2023 through the end of 2025, technical characteristics of the attack methods, and the victims. Notable cases include: Deepfake scams impersonating relatives; scams impersonating leaders using AI voice cloning; and deepfake CEO investment scams. Analyze each case and the specific legal basis for each entity. Compare the legal responses of Vietnam with those of China, Singapore, and the EU.

Chapter 4
APPROACHES AND SOLUTIONS FOR BUILDING A LEGAL FRAMEWORK FOR THE DEVELOPMENT AND APPLICATION OF ARTIFICIAL INTELLIGENCE IN VIETNAM

4.1. PERSPECTIVES ON BUILDING A LEGAL FRAMEWORK FOR THE DEVELOPMENT AND APPLICATION OF ARTIFICIAL INTELLIGENCE IN VIETNAM

4.1.1. Ensuring that the legal framework fully reflects the views and policies of the Party and the State on promoting the development of science, technology, and artificial intelligence

To ensure political unity and the Party's strategic vision, the legal framework must specify requirements for accelerating digital transformation, developing science, technology, and innovation, and implementing the guidelines set forth in the Politburo's Resolutions (Resolutions No. 57, 59, 66, and 68 for 2025 on science, technology, innovation, digital transformation, digital industry development, cybersecurity, and institutional reform), as well as the documents of the Party's 14th National Congress.

4.1.2. Ensuring scientific rigor and consistency within the legal system while meeting practical requirements

First, scientific rigor in developing the legal framework is essential for the legal framework governing AI development and application to function effectively in practice.

Second, consistency requires that all seven layers of the legal framework be coherent with one another in terms of content and logic, and consistent with the rest of Vietnam's legal system both vertically and horizontally.

Third, practicality requires that the AI legal framework be designed to suit Vietnam's specific conditions regarding institutional capacity, the characteristics of the AI ecosystem, risk-based prioritization, and legal culture.

4.1.3. Ensuring the synchronous and balanced development of the various tiers within the legal framework.

The substance of this perspective encompasses four requirements: First, synchronization in terms of timing. Second, balance in terms of the level of development. Third, proper positioning within the legal hierarchy. Fourth, appropriate recognition of supplementary sources.

4.1.4. Ensuring Compliance with International Law and Global Trends in the Context of Integration

International integration regarding AI has distinct characteristics compared to integration in traditional areas such as trade or investment; the approach to integration in developing the AI legal framework must be one of "selective compatibility".

International compatibility does not mean relinquishing policy sovereignty. Vietnam must retain the right to design an AI legal framework aligned with national interests and development priorities; this is particularly crucial in the context of intense geopolitical competition over AI.

The approach to integration should not merely involve adopting international standards but must also include actively participating in shaping those standards.

4.1.5. Ensuring National Defense and Security, Public Order, Community Interests, and the Protection of Human Rights

The protection of human rights is a prerequisite for responsible AI development.

The AI legal framework must safeguard national security interests through both defensive and proactive measures.

Legal tools must be sufficiently robust and up-to-date to prevent and combat AI-related crimes.

Preventing inequality caused by AI, protecting vulnerable groups, and ensuring equal access to the benefits of AI.

4.2. SOLUTIONS FOR BUILDING A LEGAL FRAMEWORK FOR THE DEVELOPMENT AND APPLICATION OF ARTIFICIAL INTELLIGENCE IN VIETNAM

4.2.1. On the Development and Application of Artificial Intelligence in Vietnam

From the perspective of the AI lifecycle, it is necessary to determine, at each stage of AI development and application, what conditions the legal framework should create, what risks it should control, and how responsibilities should be delineated.

4.2.2. On the Tiers of the Legal Framework for the Development and Application of Artificial Intelligence in Vietnam

4.2.2.1. First Tier

First, the Standing Committee of the National Assembly should consider issuing a separate resolution interpreting Clause 2 of Article 14 of the 2013 Constitution.

Second, institutionalize constitutional review in the drafting of AI-related legal documents.

Third, incorporate the Hanoi Convention into domestic law in accordance with the overall framework.

4.2.2.2. Second Tier

First, supplement legal definitions and establish a specific regulatory regime for AI agents.

Second, define the chain of legal liability based on the provider-deployer model, adapted for Vietnam.

Third, incorporate the principle of extended territorial application for cross-border AI.

Fourth, recommend the refinement of subordinate legislation.

Fifth, update the Criminal Code regarding crimes involving the use of AI.

4.2.2.3. Third Tier

First, issue a roadmap for Vietnamese National Technical Standards (TCVN) on AI, divided into three phases.

Second, establish a standing technical committee specializing in AI within the National Committee for Technical Regulation and Quality Control.

Third, establish a mechanism for negotiating mutual recognition agreements regarding AI certification results.

4.2.2.4. Fourth Tier

First, institutionalize the legal status of industry guidelines within legal documents.

Second, issue industry guidelines structured in a three-tier framework for three priority sectors: finance and banking, healthcare and medical devices, and public services.

Third, establish a mechanism for compliance or official interpretation within the industry guidelines.

4.2.2.5. Fifth Tier

First, develop VN-AI Verify based on a co-design model.

Second, support the development of industry-specific AI codes of conduct with independent audits.

4.2.2.6. Sixth Tier

First, the Supreme People's Court should develop a proactive program to establish AI case law.

Second, issue a resolution guiding courts at all levels on the procedures and methods for determining liability when resolving disputes involving AI that cause harm.

Third, design rules for AI evidence in legal proceedings.

4.2.2.7. Seventh Tier

First, establish a cross-sectoral AI coordination mechanism

Second, build technological and legal capacity

Third, develop a three-phase AI validation roadmap

Fourth, establish an AI Management Information System (AMIS)

Fifth, design a mechanism for expanded territorial jurisdiction and judicial cooperation on AI.

4.2.3. Specific Solutions for Building a Legal Framework for the Development and Application of Artificial Intelligence in Vietnam

4.2.3.1. Solutions Regarding the Entities Responsible for Building the Legal Framework for the Development and Application of Artificial Intelligence in Vietnam

First, an AI technology-law training program; establishing a mechanism to second AI engineers and technical experts from the private sector to work in government agencies; and international cooperation to build capacity.

Second, strengthening the National Assembly's specialized legislative role.

Third, institutionalizing the National AI Advisory Council.

Fourth, strengthening proactive international representation.

Fifth, institutionalize mandatory technical reviews in the AI legislative process.

Sixth, add the task of monitoring the entire lifecycle of AI systems.

4.2.3.2. Solutions Regarding the Content of the Legal Framework for the Development and Application of Artificial Intelligence in Vietnam

Point 1: Tiered architecture of the legal framework

First, institutionalize the National AI Policy Research Program.

Second, develop and maintain the National AI Legal Architecture Document.

Third, institutionalize an annual seven-tier gap analysis.

Fourth, institutionalize a process for reviewing compliance with mandatory international treaties during the drafting of AI legal documents.

Point 2: Regulatory principles and methods: Prohibit specific categories of systems by nature, and restore the principle of human oversight to its proper function.

Point 3: Sandbox: Protect participants and incorporate test results into the review mechanism.

Point 4: Rights and obligations of stakeholders

Affected individuals have the right to an explanation of decisions concerning them personally, and the right to request human review of decisions made by high-risk systems.

The information disclosure obligations for model providers, when their models are integrated into high-risk systems, are structured in a tiered manner.

Point 5: Compliance Assurance and Remediation Mechanisms

(i) A specialized decree on administrative penalties.

(ii) In the absence of an agreement, the deploying party remains entitled to reimbursement, prorated based on each party's respective contribution to the damages incurred.

(iii) Reinstatement of the obligation to provide evidence, documentation, and logs upon the request of a court or an arbitral tribunal, as per the draft.

(iv) Addition of a channel on the "single-window" portal for affected individuals to submit feedback or reports.

Point 6: Review and Update Mechanisms

Periodic public disclosure of reports evaluating the implementation of the AI Law. Establishment of a review cycle for the "fixed list" (of AI systems/categories). Mandatory use of incident reports, consolidated testing results, inspection findings, and complaints as the basis for review documentation.

4.2.3.3. Solutions Regarding the Process of Building a Legal Framework for the Development and Application of Artificial Intelligence in Vietnam

First, standardize the four-phase process for critical AI legislation.

Second, enhance the quality of public consultation through four supplementary measures.

Third, implement a rapid-response mechanism via a Government resolution.

Fourth, institutionalize mandatory post-implementation evaluations.

4.2.3.4. Technical Solutions for Building a Legal Framework for the Development and Application of Artificial Intelligence in Vietnam

Technique 1: Upgrade AI-RIA to three specific dimensions: technology scenario analysis, compliance cost analysis, and assessment of actual institutional capacity.

Technique 2: Refine functional definitions and establish an interpretation mechanism.

Technique 3: Fully incorporate flexible, tiered delegation of authority.

First approach: Add a mandatory review provision when the 2025 AI Law is first amended.

Second Approach: Design TCVN AI authorizations under a 12-month expedited process.

Third Approach: Pilot co-design authorization for industry guidelines

Technique 4: Refine the delineation of obligations along the value chain regarding the rule "exceeding the scope of certification to become a provider" and the mechanism for handling absent foreign providers

Technical Approach 5: Fully design the technical framework for exemption thresholds in the following sequence: establish a compliance cost database first (2027), develop VN-AI Verify concurrently (2028), and then incorporate exemption thresholds into the legislation once sufficient grounds are established (2029).

Technique 6: Finalize the codification of technical standards according to a two-phase roadmap

4.2.3.5. Solutions regarding enabling conditions

First, political will and strategic orientation: Incorporate specific, measurable targets concerning AI governance into the action plans for implementing Resolution 57-NQ/TW and Decision 1671/QĐ-TTg.

Second, institutional capacity and human resources: Organize specialized training on AI for officials involved in drafting, appraising, and inspecting regulations, as well as for judges. Invest in training experts to assess conformity and develop the capacity to accredit conformity assessment bodies.

Third, legal and technical infrastructure: Establish national-level AI testing and verification laboratories, potentially through public-private partnership models. Issue official English translations of the AI Law and its implementing guidelines. Enhance technical capabilities and interoperability.

Fourth, stakeholder engagement: Establish a regular technical dialogue forum involving regulatory authorities, businesses, the research community, and civil society organizations.

Fifth, financial resources: Allocate a dedicated budget for the development of an AI legal framework, integrated within the broader expenditure for science, technology, innovation, and digital transformation.

CONCLUSION

In the process of building a socialist rule-of-law state that fosters development, upholds integrity, takes action, and serves the people - with science and technology, innovation, and digital transformation as the main drivers, establishing a legal framework for the development and application of AI in Vietnam is an objective and urgent necessity to realize the goal of mastering advanced, strategic, core, foundational, and digital technologies, thereby contributing to improving the quality of life and firmly advancing into the era of a developing nation's rise. This is because the nature of new-generation AI raises legal issues that cannot be resolved by a legal system designed for a pre-AI world.

As this thesis examines the process of establishing a legal framework for the development and application of AI in Vietnam - a period during which such a framework is just beginning to take shape - the scientific conclusions drawn are as follows:

In terms of theory, the dissertation clarifies a system of core concepts, including "legal framework," "AI development and application," "legal framework for AI development and application," and "the development of a legal framework for AI development and application." The process of establishing such a legal framework is analyzed across four dimensions (subjects, content, procedures, and technique) and is evaluated using three distinct sets of criteria: one for the process, one for the output, and one for the necessary supporting conditions.

By drawing on international experiences from eight sources (the UN/UNESCO, the OECD, the EU, the United States, China, Japan, South Korea, and Singapore), the dissertation identifies architectural lessons that can be adapted and applied to the Vietnamese context. Based on this, the dissertation proposes a feasible legal framework architecture model for the development and application of AI in Vietnam: a seven-tiered, adaptively layered architecture with centralized coordination.

In addition, the dissertation systematically identifies and analyzes existing shortcomings to precisely determine what needs to be done next: (i) The overall level of completion of the legal framework for AI development and application in Vietnam meets basic requirements, though there is an imbalance across different levels. (ii) The current status of developing the legal framework for AI development and application across four dimensions: stakeholders lack technological and legal capabilities; the content lacks a National AI Legal Architecture Document; the

process is based on a sequential model; and the six development techniques are applied inconsistently. Typical deepfake fraud scenarios from 2023 to 2025 provide further evidence confirming that legal gaps do not exist at a single point but are distributed across all four dimensions of legal framework development.

Regarding specific solutions, the dissertation particularly emphasizes the solutions: (1) The VN-AI Verify model based on a co-design process. (2) The 12-month streamlined TCVN AI system. (3) A set of AI legislative technical tools. (4) The Supreme People's Court's proactive AI case law development program. (5) The AI Management Information System (AMIS).

The dissertation proposes solutions to establish a legal framework for the development and application of AI in Vietnam based on four components. Regarding stakeholders, it proposes building technological and legal capacity within the state apparatus; strengthening the National Assembly's specialized legislative role; institutionalizing the National AI Advisory Council; enhancing proactive international representation; and institutionalizing mandatory technical reviews in the AI legislative process. In terms of content, the thesis proposes institutionalizing the National AI Policy Research Program; developing and maintaining the National AI Legal Architecture Document; institutionalizing an annual seven-tier gap analysis; and institutionalizing a process for reviewing compliance with international treaties. Regarding procedures, standardize a four-phase process for critical AI legislation; improve the quality of public consultation through four supplementary measures; operate a rapid-response mechanism via a Government resolution; and institutionalize mandatory post-implementation evaluations. On the technical front, upgrade AI-RIA to a three-dimensional, specialized framework; refine functional definitions and establish an interpretation mechanism; fully incorporate flexible, tiered authorization; refine the delineation of responsibilities along the value chain; fully design the technical exemption ratio; and complete the codification of technical standards according to the roadmap.

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