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Article

Regulatory impact of a governmental approach for artificial intelligence technology implementation in Vietnam

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Abstract: This study assesses Vietnam's state-level implementation of artificial intelligence (AI) technology and analyses the government's efforts to encourage AI implementation by focusing on the National Strategy on AI Development Program. This study emphasizes the possibility of implementing AI at the state level in Vietnam and the importance of conducting continuous reviews and enhancements to achieve sustainable and inclusive AI growth. Impact evaluations were conducted in public organizations alone, and implication evaluations were considered optional. AI impact assessments were constrained by societal norms that necessitated establishing relationships among findings. There is a lack of official information regarding the positive impact of Vietnam's AI policy on the development of AI infrastructure, research, and talent pools. The study's findings highlight the necessity of facilitating extensive AI legislation, and strengthening international cooperation. The study concludes with the following recommendations for improving Vietnam's AI policy: implementing a strong AI governance structure and supporting AI education and awareness.

Keywords: artificial intelligence; AI effect evaluation; intelligent information risk; Vietnam's legal regulation

1. Introduction

This study examines the regulatory impact evaluation of the implementation of artificial intelligence (AI) in Vietnam since 2021, when the National Strategy on Research, Development, and Application of Artificial Intelligence Until the Year 2030 was issued. Undoubtedly, the productivity improvements brought about by AI are extremely beneficial to human beings (Bui and Nguyen, 2022; Tu et al., 2022). However, they can result in human rights violations, societal issues, and environmental damage, as well (Standford, 2021; Weidinger et al., 2021). Impact studies on AI can assist in determining the deployment of technology after comparing its costs and advantages. This condition must be fulfilled to ensure sustainable growth within a society that is profoundly affected by AI. Sustainable development will be attained only when the advantages of AI implementation outweigh the costs involved.

According to the 2023 Government AI Readiness Index study by Oxford Insights (Emma et al., 2023), Vietnam is the fifth-most ready for AI out of the 10 ASEAN member countries. Vietnam's overall AI readiness score rose from 53.96 points in 2022 to 54.48 points in 2023. In 2021, it was 51.82 points. When it comes to AI readiness, Malaysia ranks sixth, Thailand ranks seventh, and Indonesia ranks eighth. Singapore is ranked first in ASEAN. In 2023, Vietnam was ranked 59th out of 193

countries around the world. This is up from 55th place in 2022 and 62nd place in 2021. This big jump in the rankings indicates the way Vietnam has come to encourage AI study, development, and use across various sectors so that it can reach its goal of becoming a world leader in AI in the coming years, both in ASEAN and around the world.

The proposed research aims to examine the novelty of Vietnam's regulatory approach to artificial intelligence (AI) through analyzing existing legal frameworks, international standards of practice, and the socioeconomic environment of AI implementation in the country. The research will use qualitative methodologies, such as document reviews of government policies, legal texts, and international regulations, to figure out the key components of Vietnam's AI strategy. Discussions with lawmakers, industry leaders, and scholars from universities will also provide insights into the legislation's practical implications and suitability for generating innovation while addressing ethical concerns. By combining these various sources of information, the study is aimed at contributing to the discussion of AI governance in developing nations by demonstrating Vietnam's particular issues and providing an opportunity for developing a regulatory environment that encourages responsible AI development. This method not only emphasizes the research's novelty, but also presents it in a wider picture of global AI regulatory movements, providing significant lessons for other countries engaging with comparable technological advancements.

The Vietnamese government identifies AI's revolutionary potential in a wide range of sectors, including healthcare, manufacturing, and customer service, and is actively exploring to develop an environment suitable to AI research and deployment. The research question of this study is how can the Vietnamese government's regulatory approach effectively foster the implementation of artificial intelligence (AI) technology while addressing ethical, legal, and societal implications? We expect that the research will concentrate on the link between regulatory frameworks and effective AI technology implementations in Vietnam. By developing suitable regulations, Vietnam wants to take advantage of the benefits of AI while managing the related barriers, eventually establishing itself as a regional hub in AI innovation. The government's proactive strategy regarding regulation will be important in developing a sustainable and ethical AI ecosystem in the country (Dharmaraj, 2019). The Vietnamese government recently released its national AI plan until 2030, which focuses on providing a strong legislative framework, promoting ethical AI activities, and improving digital infrastructure (Bui and Nguyen, 2022; United Nations, 2022). This framework's primary components are: (1) Legislative foundations: Vietnam is aggressively building legislative laws that are consistent with international norms, such as the UNESCO guidelines on AI ethics. This entails developing a legislative framework that safeguards individual rights while encouraging innovation. (2) Data governance: The plan highlights the importance of data as a key resource for AI development. Vietnam intends to generate open datasets in diverse economic areas to boost AI research while maintaining data privacy and security. (3) Stakeholder cooperation: The regulatory framework encourages cooperation among government agencies, industry stakeholders, and academic institutions to develop a comprehensive approach to AI governance. (4) Innovation environment: Vietnam is dedicated to developing national innovation centers and creating a dynamic startup environment.

In this study, the potential benefits of AI are assumed to surpass the related costs. Many nations allocate substantial financial resources to facilitate the development of national policies pertaining to AI in pursuit of leadership in the industry (European Commission, 2018; Standford, 2021). However, to date, the extent of associated costs remains unclear. Comprehensive records of relevant expenses remain unavailable. In this study, AI determination is the first step. Further, we conduct an exhaustive examination of specific AI undertakings by surveying pertinent scholarly works. Subsequently, we chronologically record the status of the discourse on AI impact evaluations using a case study. In addition, the majority of the review research will be devoted to the effect assessment of AI that will be deployed in Vietnam since 2021. Finally, we examine the constraints and prospective challenges associated with Vietnam's AI-related impact assessment legislation.

2. Emergence and evolution of AI technologies

2.1. Definition of AI processes and operations

AI is a problem-solving procedure that generates outcomes through data analysis. Therefore, it can be conceptualised as an operation. In this procedure, an algorithm is used to initiate a series of mapping procedures once information is provided as an input variable (Russell and Norvig, 2022). The input variable in a naturally learned language is a natural-language question, and the outcome component is a machine translation response. In computer vision, an image is the input variable, and the image's characterisation constitutes the outcome parameter. The engine that makes suggestions utilises data on user behaviour as the input parameter and generates a user-specific suggestion as the outcome variable.

Often, AI is classified as strong or weak AI according to whether it can resolve issues. Weak AI is the intelligence demonstrated by machines that is only capable of performing tasks appropriately for a particular reason. On the other hand, strong AI is intelligence having the capacity to address a wide range of issues. Unlike weak AI, which lacks a specific problem resolution objective, strong AI is commonly known as artificial general intelligence. The AI that is used and manufactured today is yet to attain the intelligence level of strong AI and is, therefore, considered inadequate (Surden, 2019).

2.2. Expert system

Prior to the emergence of machine learning (ML), AI was predominantly based on rules. In the rule-oriented technique, an individual provides anticipated criteria for a particular circumstance by encoding a computer algorithm and then responds to questions in accordance with the input rules. At this time, specialists in different sectors, such as law, medical care, and economics, input a significant number of regulations through an apprenticeship program.

In the 1980s and 1990s, specialists in finance, medicine, and law extensively studied expert systems. However, many consider deep learning (DL) to be largely unsuccessful. Cases other than the one specified here could not be processed. An increase in the number of regulations enhanced management difficulties. Finally,

intelligent systems failed to satisfy society's expectations because of their lack of flexibility, complex management requirements, and operational restrictions, which brought AI development to a temporary halt (Taulli, 2021).

2.3. Overview of the learning-based methodology and machine learning application

An ML algorithm was developed to address the constraints of the intelligent system, as described earlier. Often, machines' performance in jobs that can be executed with relative ease by human beings is subpar. This phenomenon, which is known as Moravec's paradox (Moravec, 1990), refers to the contradiction that anything that is performed with ease by human beings is complicated for computing devices. This is because it is challenging to program a machine to intuitively understand what human beings can execute with ease. ML refers to a collection of techniques for solving issues affecting functionality by acquiring knowledge from data samples. Although rules are added individually by human experts, functions are deduced from sample data through a process known as learning. Regularising enables the machine to learn things that are too complicated to involve human coders and helps obtain favourable outcomes in situations that cannot be addressed easily using the old rule-driven approach (Goodfellow, 2016).

2.4. Development of deep learning and the implementation of artificial neural systems

An artificially generated neural network (ANN) is a computer model that copies how the brain's neurons exchange information. Its structure consists of lab-made neurons that connect to other neurons at various levels, including input nodes, one or more hidden nodes, and an output layer. Additionally, each layer comprises numerous neurons (Taulli, 2021). These neurons generate output values through the adaptation of activation functions to input values, which are subsequently transmitted to the following neuron. Further, the output of an artificial neuron, which accumulates the results of multiplying the value provided by a weight and adding them to the input signal, is transmitted to the subsequent neuron. In ML, ANN adjusts the weight values across interconnected artificial neurons to reduce the discrepancy between the output variable generated by the signal being supplied and the output variable values in the provided dataset. Further, DL is a technique to obtain information using a complex neural network comprising several layers (Taulli, 2021).

The DL technique is commonly used to identify intricate patterns in unstructured data, such as text, audio, picture, and video (Alzubaidi et al., 2021). The ImageNet Competition revealed that DL achieved significant reduction in error rates, which enhanced DL's prominence in the field of computer vision. In 2011, prior to the implementation of DL, the error rate was approximately 25%. After the application of DL, the error rate decreased substantially, reaching 3.57% in 2015. Interpretation revealed unstructured data, having multiple layers, to be too complex for management using simple ML. Following its remarkable success in image identification, DL was introduced in other domains, including natural language processing and self-driving car development (Goodfellow, 2016).

2.5. Origin and growth of large-scale language models

The transformer, whose development was announced by Google in 2017, uses the natural language processing approach currently used by language models. The recurrent neural networks (RNN) model, an old language model, executed computations sequentially, due to which multiple calculations had to be performed while analysing a single phrase. This restricted the use of parallel programming approaches using multiple computer units and, thereby, limited the efficiency of teaching ANNs. On the other hand, the transformer model uses a learning algorithm (Ding et al., 2013) that assigns different weights to distinct words even when learning a single sentence.

The attention mechanism renders the performance of consecutive calculations unnecessary and enables the simplification of simultaneous processing involving multiple mathematical units. Consequently, the development of an ANN for AI purposes requires fewer resources and lesser time. The model of ANNs with the attention mechanism outperformed the RNN model. Owing to long-term dependencies, the current ANN failed to recognise any connections between words that have a separation in a phrase; however, the proposed technique must concentrate on a specific word instead of analysing the input systematically. Accordingly, the issue was resolved by assigning different values to each item based on its relative relevance (Chen, 2018).

Transformers laid the groundwork for the development of subsequent popular language models. The Google BERT model enhanced the encryption of a part of the transformer design, whereas the OpenAI GPT model extended this part's functionality. BERT was initially trained on an expansive dataset by enlarging the encoding section of transformers to increase the number of neurons in the artificially generated neural networks. Google announced BERT's introduction in 2018. Since then, BERT has been generally recognised for achieving state-of-the-art performance in several natural language comprehension tasks. OpenAI introduced GPT in a series of announcements from 2018 to 2020. GPT involves an already-trained algorithm that was created by increasing the decoding algorithms built into a transformer, widening the ANN, and including a significant volume of training data.

Whereas GPT focuses on natural language generation, BERT emphasises natural language understanding. GPT-4 offers significant advancement in size and capabilities compared to earlier versions; further, the GPT-4 model is more than 10 times larger than GPT-3 and has an architecture that delivers increased scalability and specialisation (Kalyan, 2024). Few-shot learning, which is a supervised learning system that was successfully developed by us, enables the training of an existing language model using the bare minimum of data samples. A high-performance, adaptable natural language processing paradigm that can be used for specific applications without requiring fine-tuning has emerged, as well. GPT-3's language model is proficient in tasks related to novel writing and programme coding. In the latter part of 2021, a sophisticated AI language model, known as the foundation model, utilised DL techniques for transfer training, in which it was pretrained with a substantial volume of data. Integrating ML with DL represents a significant change in this approach.

3. Difficulties associated with AI technology advancement

3.1. Human rights threats

Initially, this study addressed the issue of justice regarding non-discrimination. Erroneous classifications can occur in supervised approaches, as clarified by the ImageNet Roulette scenario (Crawford and Paglen, 2021). Unsupervised learning involves a skewed training dataset that can create issues, such as the Amazon Recruitment Algorithm and COMPAS (Correctional Offender Management Profiling for Alternative Sanctions) (Ruiz, 2019). Prominent learning data biases, such as disinformation underestimation and overrepresentation, are visibly evident and may contribute to biased expressions, bad language, derogatory remarks, and effectiveness disparities.

The need for simplicity in the appropriate explanation of the topic is emphasised (Aslam et al., 2022; Kaminski, 2019). Often, AI functions efficiently but lacks extensive explanatory ability. Conventional language models pose additional difficulties compared to extensive AI language models. AI-supervised learning at massive scales offers possible but often inaccurate answers. When the decision-making procedure cannot be clarified, determining the infringement of an affected individual's authority, despite the model's outstanding performance, is challenging (Mittelstadt et al., 2018).

In 2019, Kaminski raised questions regarding accountability (Kaminski, 2019). You will be held liable if you injure others. The liability of indirect discrimination based on sensitive features is mostly restricted to situations outlined by particular legislation. Nevertheless, AI use can have adverse outcomes, despite finding it challenging to establish a direct cause-and-effect link and cause any harm to users. AI ethics requires programmers and operators to prevent this situation. Responsibility includes proactive control, unlike legal or moral duties, which often emphasise reactive behaviour.

3.2. Social and environmental risks

AI technologies are expected to advance and become widely utilised and accepted within the community. Additionally, AI may enhance unemployment levels and lower wages since technologies such as cobots can partially replace human labour (Lee, 2018) and automation adversely affects employment (Hayes et al., 1992). The proliferation of automated devices is expected to reduce the number of customer support workers by 2029 (Brynjolfsson et al., 2023). Relevant data were sourced from the US Bureau of Labour Statistics in 2021. Another perspective is presented, as well: AI may eventually replace human employment in the near future (Lambert and Cone, 2019). Further, technological advancements in AI may significantly widen the pay gap between high- and low-wage occupations, which may negatively affect those having restricted technological resources (Sambasivan and Holbrook, 2018).

Earlier, content creation was a costly and time-consuming process. However, today, content can be created inexpensively and rapidly. Therefore, the profit increase of new and creative projects is expected to reduce over time. This trend is particularly evident in the models created using AI of significant scales. In this respect, a

noteworthy example is DALLE 2, which was announced by OpenAI in 2022. Today's massive AI language models generate text that reads naturally, whereas DALLE 2 generates a picture based on natural language input. DALLE 2 generates a picture of a fake element, rather than selecting a photograph of a real object, and challenges the notion that machines cannot recreate human innovation.

AI's operational and learning processes consume enormous amounts of energy, and Machines undergo training by analysing massive amounts of various data. Further, advanced AI techniques that were developed in 2021 use greater amounts of power than current models due to their large scale of AI. This creates substantial environmental expenses (Bender et al., 2021) due to two potential reasons: Initially, training and running the model require a substantial amount of energy, and the model releases significant amounts of carbon (Patterson et al., 2021). Further, significant amounts of cold fluid must be provided to effectively cool the computer infrastructure during computational activities (Mytton, 2021).

4. AI technologies in other regulation types and their implications

4.1. Basic aspects of the cost-benefit technique

Since they have human rights, social, and environmental implications, technological advancements in AI have both advantages and disadvantages. AI technology is beneficial when its advantages surpass its expenses. This approach is referred to as a cost–benefit analysis; an environmental impact assessment (EIA) is commonly conducted, as well. In general, once the environment is damaged, its complete restoration to the original state is difficult. Although recovery is feasible, relevant treatments can be expensive. In 1970, the United States introduced EIA to create ecologically sustainable business plans that recognise the benefits and costs of actions affecting the environment (Canter, 1982).

The cost–benefit technique is commonly used in several disciplines for different purposes. Gender impact analysis involves evaluating and comparing the current situation and future expectations of implementing an identified policy using gender-specific criteria (European Institute for Gender Equality (EIGE), 2016). Further, privacy impact evaluation methodologically evaluates the potential effects of a project's activities on people's privacy and offers suggestions for managing, restricting, or mitigating any negative effects (Office of the Australian Information Commissioner (OAIC), 2021). Additional safety impact assessments are available, as well.

4.2. Risk-based approach to AI technologies

Currently, the cost–benefit technique is being applied widely in the AI domain. Its current beneficial effects include the advancement of health and happiness facilitated by AI technologies. There is a financial consequence for the human rights violations or social and environmental damage caused by AI use. Over the past few years, this subject has been initiating significant debate on AI ethics. Further, the concept of incorporating risk-based advancements in AI technologies by implementing a cost–benefit technique is relatively new.

This was analysed from four different perspectives: The first step was to evaluate AI's effects on personal information (European Data Protection Supervisor, 2019). The 2018 Data Protection Impact Report of the European Union (EU) is a representative example in this respect. The second component was an AI-driven risk assessment tool. Some examples of tools are the Canadian Administration's Algorithms Assessment of Effect Tools from 2019 and the EU's Higher Levels Experts Group of AI's 2020 Examination List on AI Trustworthiness. Further, the third type of evaluation focused on AI's impact on human rights, which is exemplified by the EU's assessment of the impact of AI systems on human rights, democracy, and the rule of law in 2021. Finally, the fourth evaluation type was the AI Effect Evaluation Act (draft version). An example is the Algorithmic Accountability Act of 2019, which is an important legislation in the United States.

4.3. Evaluation of the impact of the EU's data protection efforts

The EU's General Privacy and Data Protection Regulation (GPDP), implemented in 2018, contains some crucial rules for automated decision-making systems: According to Article 35, a data protection impact assessment must be conducted for high-risk processing of personally identifiable information. The General Data Protection Regulation provides significant supervision for AI technologies and the use of automated decision-making systems. Nevertheless, the legislation has significant limitations.

4.4. Risks evaluation toolkits

Since 2019, the Canadian government has been utilising the Canadian Algorithms Assessment of Impact Programme, which is required to be implemented by governmental entities. Accordingly, Canadian governmental institutions must conduct Impact Assessments before using AI. The assessment results outline the actions required to reduce risk.

In July 2020, the EU released its Evaluation List on Trustworthy AI. In June 2018, the European Commission entrusted the High-Level Experts Forum on AI with examining methods to govern AI. Subsequently, in April 2019, trusted and dependable AI ethical principles were announced. Finally, the Evaluation List was provided based on these foundational principles.

4.5. Evaluation of the human rights effect

In 2019, the EU's Council of Europe's Commission on Human Rights issued a recommendation titled "The Black Box of AI: Ten Steps to Protect Human Rights." Its purpose was to propose strategies to prevent and reduce the adverse impacts of AI on human rights. This recommendation emphasises human rights impact analysis. Further, in 2020, the Council of Europe adopted the Recommendation of the Council of Europe by the Ministerial Committee on Human Rights Impacts of Algorithm Technologies (Aytmatova, 2020).

The appendices of the Council of Europe detail the Instructions for Responding to Human Rights Effects of Algorithmic Systems, which defend the rights and freedoms of people outlined in the European Convention on Human Rights regarding

the use of advanced technology by offering declarations and private party instructions on creating and improving algorithmic systems. Further, the AI Systems Evaluation of Effects on Human Rights, Democracy, and the Rule of Law, that is, the Ad Hoc Committee on AI, was established in 2021 (CAHAI—Ad hoc Committee on Artificial Intelligence, 2021).

4.6. AI evaluation of effects regulations

In 2019, although the US Senate presented the Algorithmic Integrity Act, it was not approved by members. Similar to the EU's General Data Protection Regulation, this effort utilised the evaluation of the impact of monitoring AI and various other automated systems on decision-making. Businesses using automated decision-making systems must evaluate the effects of fairness, prejudice, discrimination, and the safety and security of personal data. The bill's proposed single regulatory framework is inadequate to effectively supervise diverse AI systems because of the availability of a wide variety of automated decision-making systems. A 2020 study stated that the law mandated a sectoral approach to supervisory rules to facilitate effective policy implementation (Chae, 2020).

Furthermore, it is recommended as it applies to the compliance examination of the EU AI Act of 2021 (draft). The EU formerly categorised AI into unacceptable-, high-, restricted-, and low-risk groups. Further, an earlier compliance review was necessary to implement high-risk AI. This approach focuses exclusively on the technology itself, including its safety certification, rather than analyses of the effects of its use. Since the use of AI technologies necessitates an assessment, compliance evaluations must be included in the future draft of the Impact Assessment Bill.

4.7. Lessons affecting Vietnam's regulations and laws

AI effect assessment involves the ethical use of AI through impact analysis. The impact evaluation of AI technology has a short history. However, the aforementioned legal examples include the following constraints: The Privacy and Data Protection Evaluation of Impact (2018) of the EU represents a framework for protecting private data but fails to focus exclusively on AI, due to which it cannot effectively address AI-related environmental and social risks (European data protection supervisor, 2024).

The Canada's Directive on Automated Decision-Making: Algorithmic Impact Assessment (AIA) (2019) and the EU's Examination Listing on Trustworthy AI in 2020 proved challenging to conceptualise unlike traditional assessments of impact methodologies. This result can be broadly considered an AI evaluation of the impact technique. The impact assessment technique typically follows the framework outlined by the National Environmental Policy Act of 1969, which relies on public engagement through transparency and a feedback system, which is primarily based on the public service model (Selbst, 2021).

The Human Rights, Democracy, and Rule of Law Impact Analysis of AI Systems (2021) has an identified assessment objective (Artificial Intelligence Policy Development Group, 2021). The challenges arising from the progress of AI technology involve infringements of human rights and societal and ecological issues. To encourage responsible growth, a sustainability evaluation technique that considers

factors related to both human society and the environment must be developed.

In 2019, the US Algorithmic Accountability Act was introduced; however, it did not have legislative authority (Algorithmic Accountability Act of 2019, 2019). Furthermore, the specific and distinct risks associated with each AI service were not thoroughly assessed and, finally, a uniform policy was implemented. Subsequently, the Algorithmic Accountability Act of 2022 was enacted with the same provisions.

In 2023, Vietnam revised its Framework Act on Intelligent Informatics to incorporate AI impact assessments and showcase the efficiency of current assessment methods. Section 5 thoroughly examines the importance and constraints of this aspect.

4.8. The conceptual modeling compares Vietnam's regulatory framework against that of other ASEAN member nations and the Indo-Pacific Economic Framework for Prosperity (IPEF) community

The conceptual model in this research compared Vietnam's regulatory framework to those of other ASEAN member nations with the objective to identify best practices and opportunities for development. Countries like as Singapore and Malaysia have developed comprehensive AI programs that emphasize ethical issues, governance of data, and public-private collaborations (Dharmaraj, 2022). Vietnam can improve its regulatory procedures while making contributions to the ASEAN Community's broader efforts. This collaboration not only improves regional innovation but also promotes ASEAN as a competitive participant in the global AI situation, promoting sustainable economic growth and ethical technology activity. **Table 1** presents the contribution of Vietnam's regulatory framework to ASEAN and the IPEF community's efforts.

Table 1. Several ways Vietnam's regulatory framework can significantly contribute to ASEAN and the IPEF community's efforts.

Contribution to ASEAN Community's Efforts	Contribution to IPEF Community's Efforts
1) Regional collaboration: By matching its AI legislation with ASEAN rules, Vietnam encourages more regional collaboration in AI development. This compatibility makes much simple to exchange data across borders, collaborate on research projects, and develop joint innovation hubs. 2) Knowledge Sharing: Vietnam's study serves as a valuable resource for other ASEAN countries looking to develop or enhance their own AI regulatory frameworks. By sharing insights and best practices, Vietnam can help elevate the overall regulatory landscape within the region. 3) Economic Integration: As Vietnam positions itself as a hub for AI innovation, it attracts foreign investment and talent, contributing to the economic integration of ASEAN. This growth can lead to increased competitiveness for the region in the global AI market. 4) Ethical AI Development: By prioritizing ethical considerations in its regulatory framework, Vietnam sets a precedent for responsible AI governance in the region. This commitment aligns with ASEAN's goals of promoting sustainable and inclusive economic growth.	1) Sharing best practices and lessons learned from its regulatory development process, fostering knowledge exchange and capacity building among IPEF member countries. 2) Promoting regional cooperation in areas such as data sharing, talent development, and the establishment of AI innovation hubs, leveraging the IPEF's connectivity initiatives. 3) Advocating for the inclusion of AI governance in the IPEF's policy agenda, ensuring that responsible and ethical AI practices are integrated into the framework's economic and trade agreements. 4) Attracting foreign investment in AI-related sectors, contributing to the IPEF's goal of promoting sustainable and inclusive economic growth in the Indo-Pacific region.

The IPEF, which was founded in 2022, planned to promote economic cooperation, increase the resilience of supply chains, and boost innovation among its Indo-Pacific member nations (Bui and Nguyen, 2022). Development of artificial intelligence and responsible governance are key priorities for the IPEF's "Connected Economy" pillar. By comparing its AI regulatory proposal of the conceptual modeling

compared Vietnam's regulatory framework with those of other ASEAN member countries and the Indo-Pacific Economic Framework for Prosperity (IPEF) Community. In compliance with IPEF rules, Vietnam may contribute to the standardization of regional standards and motivate regional collaboration in AI research and development. This alignment also increases Vietnam's appeal as an investment destination for foreign firms seeking to benefit on the country's AI potential.

5. Examination of Vietnam's AI impact evaluation

5.1. Definition of intelligent information technology services impact on society analysis

Although AI systems are beneficial to users, they may inadvertently have adverse effects on the environment or society. Despite the availability of a bypass design with equivalent performance, higher energy consumption may increase environmental costs due to the rise in carbon emissions. Introducing AI systems in society may potentially replace a substantial proportion of human labour and, thereby, cause societal challenges, including unemployment and financial hardships.

Vietnam conducted a social impacts evaluation of intelligent information technology services to enhance sustainability by maximising AI's beneficial effects and minimising its associated expenses. In Vietnam, the notion of "IF Technology" was not implemented until the commencement of Decree No. 13/2023/ND-CP of the Government of Vietnam dated 17 April 2023 on the protection of personal data (Decree 13) (Vietnam Government, 2023); Article 17 of Decree 13 of the 2023 Framework Act for IF mandates the implementation of social effect analyses focusing on AI for IF services (Vietnam, 2023). This was the first global implementation of NEPA-style impact assessment legislation.

5.2. Goals of the social empirical investigation of IF services

An examination of how the utilisation and progression of IF services affect residents' lives, society as a whole, economics, culture, and daily routines can be undertaken by both municipal and state governments. The examination should consider the following diverse aspects: (1) the reliability and security of IF services; (2) the effects of knowledge culture, particularly those bridging the technological gap, safeguarding respect for privacy, and ethical considerations of the IF community; (3) economic and societal effects, including job opportunities, labour, equitable trade, industrial structure, and users' rights and interests; (4) implications for data confidentiality; and (5) the additional impacts of IF services.

In Vietnam, both national and municipal administrations are currently evaluating how IF services affect society. They have the authority to conduct such evaluations at their discretion. This is not the responsibility of municipalities or state administrations. Vietnam's technology impact evaluation strategy is outstanding because the government requires yearly evaluations. The goal of IF operations' societal impact evaluation is to assess how the utilisation and spread of IF services, which substantially affect individuals' lives, can affect society, economics, and culture.

The goal of IF services' societal evaluation is to assess how the implementation and adoption of these services influence individuals' lives, economy, society, and culture. Hence, the societal evaluation varies from a technology impact analysis, which predicts the future by considering technological progress. Whereas the technology evaluation research focuses solely on the technology, the social impact assessment does not.

5.3. Evaluation items of intelligent data services social impact assessments

The crucial factors of assessments of IF services' societal impact are protection reliability and intelligent information retrieval solutions (Decree 13, Article 124.1.2). Protection and reliability are the aspects of intelligent information services, such as AI, that are the most debated. Protection can be achieved by implementing technological, administrative, and physiological safeguards. Decree 13, Article 124.1.5 should be construed in terms of industrial safety, rather than information security. However, the term reliability is a governance framework that encompasses the AI-related ethical discussion. Its purpose is to reduce the risk of human rights infringements. This necessitates an impact assessment on human rights.

AI's societal impact is examined by Social Assessment Methods of IF Services. The services' evaluation criteria encompass influences pertaining to information culture (Decree 13, Article 124.1.3) and implications for society and the economy (Decree 13, Article 124.1.4). This review addresses the impact of information culture on information gap reduction, privacy, and ethical considerations in an IF society, as outlined in Decree 13, Article 124.1.4. It discusses the environmental impact of AI, as well. One of the assessment criteria is IF services' impact on society, economics, culture, and residents' everyday life, as stated in Decree 13, Article 124.1.6. These items are assessed for their social and environmental risks. It is noted that existing AI impact assessments are not completely effective in risk assessment.

5.4. Methodology to evaluate the social impact studies of IF services

Once the national government approves the investigation and evaluation of AI's societal implications, the Vietnam Ministry of Information and Communication reports the findings of social impact evaluation. The leader of the Ministry can propose appropriate actions to national authorities and commercial operators, such as improving the reliability and protection of IF services. The analysis' efficacy depends on the latest environmental impact assessment. Formally publicised outcomes of the social impact analysis are recommended but not integrated into regulations.

The law does not outline any specific further action. The social effect analysis for IF solutions function as a risk analysis system, and the assessment framework is expected to be utilised during the evaluation. The evaluation identifies the AI service's current risk level according to its impact on social impact evaluation. Since it serves as a state-level impact evaluation, it poses a risk of excessive regulation; hence, an agency's independence, objectivity, and expertise must be guaranteed. Communication involves understanding the perspectives of policymakers, experts, stakeholders, and the general public and sharing the findings of the social effects

evaluation. Managements must propose initiatives to enhance the reliability of AI services and reduce associated risks. This legislation can actively mitigate hazards, rather than simply incorporating them into policies involving environmental impact evaluations.

5.5. Importance of and impact restriction on social evaluations of IF services

In Vietnam, the societal impact evaluation of IF services involve all the risk-based system methodologies that were studied previously. The security of data effect evaluations involve considerations such as privacy (Decree 13, Article 124.1.3) and the evaluations' impact on information security (Decree 13, Article 124.1.5). The assessment of the protection and reliability of intelligent digital platforms is part of human rights impact evaluations (Decree 13, Article 124.1.2). Social effects evaluations consider the human and environmental consequences of AI use and, hence, are more thorough than earlier assessment techniques. They were not detailed in as much depth as the Risk Evaluation Instrument used by the EU or Canada. The evaluation of the societal influence of Vietnam's IF services is still in its early stages, and subordinate legislation is yet to be implemented.

5.6. The case study of the responsible AI development in healthcare relating the Vietnam's AI regulatory approach

One area where Vietnam's AI regulatory framework has had a significant impact is in the healthcare sector. The Ministry of Health has been proactive in developing a plan to apply and develop AI in medicine. This includes issuing Decision 4888/QD-BYT in 2019, approving a project on applying and developing smart medical information technology for the period of 2019–2025; Emphasizing the importance of applying digital and smart technologies in healthcare to build a modern, quality, fair, efficient, and internationally integrated Vietnamese health system; Collaborating with the Ministry of Science and Technology to develop regulations on AI ethics, based on international principles and experiences from other countries To achieve an optimal balance between AI innovation and responsible development, Vietnam's regulatory approach should continue to adapt international best practices while tailoring regulations to the local context, ensuring they are effective and enforceable; Foster public-private partnerships to encourage collaboration between government agencies, industry stakeholders, and academic institutions; Invest in digital infrastructure and data governance to support AI research and development, while prioritizing data privacy and security; Enhance educational programs at all levels to cultivate a skilled workforce and promote public understanding of AI technologies; Regularly review and update regulations to address emerging challenges and ensure they remain relevant in a rapidly evolving technological landscape. Vietnam's governmental approach to AI regulation has had a significant impact on the country's AI landscape, fostering innovation while addressing ethical and societal concerns. By adapting international best practices, investing in digital infrastructure, and promoting collaboration among stakeholders, Vietnam is well-positioned to become a leader in responsible AI development within the ASEAN region and globally.

5.7. Discussion

The regulatory influence of the Vietnamese government's approach to AI technology adoption is defined by its concentration on developing a complete legislative structure that promotes innovation while solving ethical issues. The continual development of rules, guided by internationally standards and regional preferences, underlines Vietnam's goal to become an AI leader in ASEAN and worldwide. There are expected important regulatory factors:

Legal framework improvement: The Vietnamese government is starting a national strategy that involves defining a complete legal structure for AI. This includes developing rules to control AI applications, ensuring that they are applied ethically and responsibly while continuing to promote innovation.

Ethical and social implications: As AI technology grows, issues relating to privacy, data security, and discrimination must be addressed. The government is responsible for enacting laws that eliminate these risks while protecting privacy rights and promoting fair conduct.

International rules and partnerships: Vietnam plans to take advantage of international rules, including the European Union's AI Act, to assist defining its regulatory policies. This legislation offers an administrative framework for AI governance, focusing on risk assessment and ethical issues that Vietnam can adapt to its particular requirements.

Adoption by the public and development of the workforce: For Vietnam to successfully use AI technology, it needs to educate the public about its benefits and fill the skills gap in the workforce. This includes making education programs better so that there are trained workers who can meet the specifications of an economy driven by AI.

6. Conclusions

The impact evaluation of Vietnam's AI use has the following limitations: First, impact evaluations were implemented exclusively within the public sector. This is because the evaluation results were restricted to instances in which national and local government agencies utilised IF services. The legislation for private businesses was considered insufficient. Accordingly, it is necessary to expand and implement effect evaluations in the private sector, as well. The evaluation of this effect is not mandatory. Further, in this instance, the evaluation's impact involves judgements by the government or local authorities. This is vital for medium- to long-term policy planning and technological advancement and execution. Evaluations of the impact of AI use should be made obligatory in the public sector. For any effort expended by the private sector, it is crucial to make decisions on how to offer rewards.

The Private Information Protection Act's examination of the personal information effect distinguishes between public and private sectors. Further, public organisations must evaluate privacy impact in the case of an individual's information breach, whereas private organisations can optionally evaluate the data protection impact or certify a confidential data encryption management system. Additionally, bidders obtain additional points through private-sector acquisition.

In general, studies neglect the significant environmental and human rights

repercussions of AI use. Impact assessments should include concerns pertaining to human rights and the environment. To achieve this objective, the Intelligent Information Management Framework Act must be modified. Additionally, government agencies must consider the relationships among all fields of influence research while developing impact assessment strategies. However, the social evaluation of impact was considered adequately comprehensive in privacy assessments. Furthermore, privacy is subjected to the Privacy Effects Evaluation demanded by the Personal Information Protection Act. Hence, since impact evaluation has several overlapping aspects, it is necessary to determine the evaluations to be prioritised, findings to be examined, and manner of modification of the evaluation schedule.

It is noted that evaluations of the societal impact of Intelligent Data Systems lack precision. These reviews are imprecise and lack depth because they address only the fundamental components of a nation's intelligent information technology projects. It is crucial to establish a framework and appropriate criteria to evaluate the impact of AI use. The implementation of unique AI necessitates the adoption of a specific approach. AI technologies are categorised into the fields of natural language processing, machine vision, automation, and rule-driven algorithms. The use of a single assessment criterion for different factors may generate uneven results.

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