HOW CAN REGULATORS IN DEVELOPING NATIONS DESIGN EFFECTIVE AI LAWS?

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Abstract. This paper investigates how law makers in developing nations can design effective AI regulations that mitigate risks and promote innovation while catering to their national characteristics. Reason for the analysis is that organizations in many developing countries are severely affected by new AI tools yet regulators do not possess corresponding laws to govern the usage. Furthermore, while scholars already identified a range of design principles for AI laws none of them consider the distinct characteristics of developing nations. These laws need to be designed differently than in developed nations because traditional regulatory theories often fail in the unique institutional contexts of developing countries, where weak government agencies, limited infrastructure, and differing socio-economic conditions require tailored approaches to ensure effective growth and poverty reduction. By using an eDSR methodology this study proposes five AI law design principles for developing nations. These principles challenge the regulatory theory of collective prospective sensemaking by highlighting how its abstraction and elaboration processes falter in contexts with institutional fragility and limited resources. The principles furthermore complement the existing theory of regulation design within contexts of institutional limitations by providing a perspective on laws for novel technologies.

Keywords: Artificial intelligence, regulation, developing nations, design science

1 Introduction

The rapid advancement and integration of artificial intelligence (AI) technologies in various sectors have prompted governments worldwide to reconsider and reshape regulatory frameworks [1-3]. Notably, the European Union has pioneered with the passage of the Artificial Intelligence Act, establishing a precedent for legislative governance of AI [4]. Artificial intelligence, in this context, refers to systems or machines that mimic human intelligence to perform tasks and can iteratively improve themselves based on the information they collect [5]. Regulation, pertaining to AI, involves the development of rules and standards designed to govern the development, deployment, and utilization of artificial intelligence technologies, ensuring they align with societal values and legal norms [6]. Concurrently, other nations including the United States, the United Kingdom, Australia, and Singapore have escalated their efforts to formulate or enhance AI regulatory measures [7-8], underscoring the universal recognition of AI's significance

and the imperative for structured oversight [9]. Simultaneously, scholars increasingly draw attention to designing effective regulation in developing countries characterized by low levels of Gross National Income (GNI) per capita [10]. Reason for the increasing research is that traditional regulatory theories fail in these nations as they face challenges such as weak institutions, inadequate infrastructure, socio-economic disparities and high degrees of corruption that make established theories and policy recommendations unapplicable [11, 12].

However, scholars have yet to provide substantial guidance on designing AI laws specifically for developing countries, leaving a significant gap in regulatory knowledge. This gap is particularly concerning as generative AI tools like Google Gemini and ChatGPT are already gaining widespread traction in regions such as Africa and Southeast Asia. These tools are rapidly disrupting markets and influencing critical sectors like infrastructure and healthcare, yet no regulatory frameworks specific to those nations exist to govern AI usage or ensure ethical implementation [13]. Existing theories, such as those by Seidel et al. [14], which focus on collective sensemaking in high-income countries, cannot be directly applied to developing nations due to fundamental differences in institutional capacity, infrastructure, and socio-economic conditions [15]. This lack of tailored regulation risks exacerbating inequalities and undermining trust in AI technologies, making it imperative to develop context-specific solutions that address these unique challenges.

Hence, the purpose of this study is to answer the question: “How can regulators in developing nations design effective AI laws?”.

To answer this question, an Echelon Design Science Research (eDSR) study was performed as outlined by Tuunanen et al. [16]. This approach is based on the design science research methodology (DSRM) outlined by Peffers et al. [17] aimed at creating an artifact in the form of several principles for AI regulation in developing nations. This paper covers three echelons: problem analysis; objectives & requirements definition; and design & development. These three echelons correspond with the first three steps of Peffers et al. six-step DSRM approach [17]. The last three DSRM steps (demonstration, evaluation, and communication) will be addressed in future work. To design the solution a dataset of existing AI laws across sixteen developed and developing nations as well as a range of international AI standards were analyzed, collected between February and December 2024. This approach enabled the identification of five design principles for AI regulation under consideration of developing-country-specific characteristics.

Addressing the research question provides an empirical contribution by giving regulators in developing countries actionable design principles to craft AI laws that balance innovation with safety while incorporating country-specific strategic considerations such as poverty reduction measures. Furthermore, while building on Seidel et al.'s [14] theory of collective prospective sensemaking, this research challenges its universality by highlighting how their abstraction and elaboration processes may falter in contexts with institutional fragility and limited resources. Similarly, it critiques the regulatory framework of Estache and Wren-Lewis [11] for its limited guidance on integrating emerging technologies like AI into structurally weaker economies. By focusing on the unique socio-economic and governance conditions in developing countries, this study

demonstrates the need for more context-specific approaches, contradicting the implicit assumption of these prior theories that their methods can seamlessly apply across diverse settings. Through these theoretical critiques and adaptations, this research contributes a nuanced perspective to the field of technology regulation.

2 Methodology

This study follows the Echelon Design Science Research Approach (eDSR) coined by Tuunanen et al. [16] which in turn is based on the Design Science Research Methodology (DSRM) outlined by Peffers et al. [17]. This combined methodology provides a framework for conducting design science research while offering the opportunity to split the efforts into several projects. This project consists of three echelons as outlined by Tuunanen et al. [16] coinciding with the first three steps of the DSRM: problem analysis, objectives & requirements definition and design & development. This furthermore leaves the opportunity for future work covering the last three DSRM steps: demonstration, evaluation, and communication. The methodology is applied as follows:

1. Problem Analysis: The research begins with a thorough articulation of the problem through an extensive literature review to understand the current state of theory on AI regulation overall and the specific challenges faced by developing nations. Key analyzed sources include Berente et al. [1], Floridi et al. [2], Cath et al. [3], Estache & Wren-Lewis [11] and Seidel et al. [14].

2. Objectives and Requirements Definition: Based on the identified problem an objective of the design science project and a corresponding set of clear criteria is defined. The criteria are designed to address unique socio-economic and institutional challenges of developing countries as defined by the United Nations [18] while making them universally applicable regardless of the developing countries region, culture and politics.

3. Design and Development: This phase involves the creation of an artifact in the form of a comprehensive set of design principles for AI regulation in developing countries. The principles are based on the analysis of a dataset of existing AI laws and standards gathered between February and December 2024 via a web-based legal review across sixteen regions: the EU, the UK, Canada, the USA, Mexico, Nigeria, South Africa, Saudi Arabia, Australia, Singapore, Japan, the UAE, Brazil, China, Switzerland and India. The selection was done based on two criteria: 1. Each chosen region must have started AI regulation development processes and 2. Both developed and developing countries must be represented. The resulting dataset containing all information and sources of the respective laws and standards can be accessed upon request.

The methodology is further informed by Hevner and Chatterjee's [19] design science research framework, using a relevance, rigor, and design cycle. This cycle ensures continuous review of the knowledge base, verifies its applicability to real-world problems, and facilitates iterative artifact design.

3 Problem Analysis

To analyze effects of AI regulation on “developing countries” one must first define the term. According to the United Nations, countries can be classified into three categories: 1. Developed, 2. Economies in Transition and 3. Developing [18]. To define a threshold for these groups of countries the UN most commonly utilizes the metric Gross National Income (GNI) per capita based on the World Bank Atlas Method which puts all countries into the “developing” category that have a GNI per capita of $4,085 or less [18].

Based on this definition, there is a rich stream of research on regulation in developing countries. Most importantly Antonio Estache and Liam Wren-Lewis establish a theory for regulation in developing countries based on an approach by Jean-Jacques Laffont [11]. They argue that traditional regulatory theories from developed countries are unsuitable for developing nations due to six characteristics outlined below in chapter 4. This unsuitability results in regulatory inefficiencies and underinvestment. The authors propose solutions including high-powered incentives, fostering competition, creating multiple regulatory agencies, and increasing consumer participation to enhance accountability and reduce corruption. They emphasize the need for tailored regulatory policies that account for each country's specific institutional context, advocating for simpler regulatory structures, achievable goals, and flexibility. However, the paper does not provide detailed recommendations for technology regulation thus leaving a research gap. Even the paper itself calls for more specific research into regulatory frameworks for various topics that better accommodate the realities of developing countries to improve regulation efficiency, foster growth, and reduce poverty – thus further emphasizing the need for this study.

In addition to the work by Estache & Wren-Lewis there is a related research conversation by Seidel et al. [14] in which the theory of collective prospective sensemaking is introduced and applied to the regulation of emerging technologies. Through an exploratory case study on Liechtenstein's development of a law on trustworthy technology, the authors detail how actors from various sectors (e.g., government, legal, industry, and technology) engaged in iterative abstraction and elaboration processes. These processes allowed for a shared understanding and reconceptualization of regulatory targets, transitioning from a focus on blockchain for cryptocurrencies to a broader framework addressing trustworthy technologies. Abstraction generalized key technological features, while elaboration specified detailed requirements, enabling the law to balance innovation-friendliness with legal certainty. The theory enriches this research effort by offering a methodological lens to explore how regulators might approach AI lawmaking, especially in contexts marked by technological ambiguity – yet it does not provide a view on developing nations. While Seidel et al.'s model is rooted in a high-income country's context, this work evaluates whether the processes of abstraction and elaboration can address the unique challenges – such as weaker institutions and limited technical infrastructure – faced by regulators in developing economies. In doing so, this research challenges the universality of this sensemaking-based regulatory theory.

Furthermore, there are a wide range of other researchers which have started to analyze the effects AI regulation which this paper builds upon. Most importantly, Almeida et al. proposed a structured framework for AI governance, emphasizing the need for

regulations that align with ethical considerations and societal values [6]. Their work suggests that effective AI regulation should not only address the immediate impacts of AI technologies but also anticipate future developments and challenges. Other researchers such as Floridi et al. [20] argue that the European Union's pioneering efforts, through the enactment of the Artificial Intelligence Act, demonstrate a proactive approach to legislative governance of AI and should hence be used as a blueprint by other regulators. Yet other researchers such as Erdélyi and Goldsmith suggest that international collaboration in AI regulation design could lead to more consistent and effective frameworks [9]. Additionally, they argue that such coordination could mitigate the risks of fragmented regulations that might impede innovation and create compliance complexities for global entities. However other researchers such as Hacker [21] raise concerns about the sustainability of coordinated AI regulations, pointing out the potential for such frameworks to cater to the lowest common denominator, possibly stifling innovation or failing to adequately address specific regional needs [21]. Especially in developing countries the challenge of designing effective AI regulation remains, hence illustrating the need for this research effort further [22].

Lastly, regulators themselves have pointed out the challenges that they face in developing countries in AI law development. These challenges include limited access to technical expertise, which hampers the ability to understand and regulate complex AI technologies effectively [13]. Additionally, there is often a lack of adequate infrastructure to support the deployment and monitoring of AI systems, making it difficult to enforce regulations [11]. These issues are compounded by the rapid pace of AI advancement, which outstrips the ability of lawmakers to keep up with technological changes and implement appropriate regulations [3]. As a result, many developing countries struggle to establish AI laws that are both effective and enforceable [19].

4 Objectives and Requirements Definition

Estache & Wren Lewis outlined a set of exhaustive and mutually exclusive characteristics of developing nations to inform their regulation design theory for these regions [11]. These characteristics have been refined further to integrate the guidance of several additional researchers [13, 18, 23]. The resulting set of characteristics are utilized as criteria for this design science project and can be summarized in six arguments:

4.1. Social and economic priorities to reduce poverty and improve social services: Unlike developed nations, developing countries prioritize affordability and access to essential services such as water, electricity and healthcare over efficiency and innovation. Regulatory frameworks must address these social and economic challenges, including low consumer ability to pay [23].

4.2. Weak institutional capacity: Developing countries face limitations in regulatory capacity, accountability, and fiscal efficiency due to resource constraints and inadequate infrastructure. This weakens the ability to enforce rules effectively and fairly [18].

4.3. Commitment and stability issues: Governments in developing nations often struggle to uphold long-term commitments in contracts and regulations, leading to

frequent renegotiations, reduced investor confidence, and underinvestment in critical sectors [11].

4.4. Greater vulnerability to corruption: Higher levels of corruption and collusion between regulators, governments, and firms undermine trust and efficiency, distorting privatization processes and regulatory outcomes [11].

4.5. Limited competition and market maturity: Markets in developing countries are often less competitive and more monopolistic, requiring regulatory approaches that differ significantly from those used in developed nations [13].

4.6. Lack of skilled human resources: Developing nations typically lack the highly-educated specialists needed to develop and enforce a complex law framework for novel technical fields or experience a "brain-drain" – a situation where highly-educated specialists decide to leave the country [11]

By addressing these characteristics, the principles for AI law design will be comprehensive, adaptable, and effective across all developing countries.

5 Design and Development

In the context of this research effort a total of sixteen developed and developing countries were analyzed concerning their AI regulation efforts with a total 54 laws pertaining to AI reviewed through a review of legal texts, regulatory websites and national press releases. An additional nine standards on Artificial Intelligence by global standardization bodies such as ISO were reviewed as well. The resulting dataset is available upon request. The insights from these artificial intelligence laws and standards were then structured to address the six categories outlined in chapter 4 concerning requirements of regulations in developing nations to create an exhaustive and mutually exclusive set of principles. In total this analysis uncovered five core findings structured as principles for regulators in developing nations that can be found in table 1 (5.1-5.5) and are described in more detail in the sub-chapters after:

Table 1. Developing Nation Characteristics mapped to AI Regulation Principles

Characteristics of Developing Nations	Principles for AI Regulation in Developing Nations	Explanation of the Mapping
4.1 Distinct social and economic priorities to reduce poverty and improve services	5.1 Structure laws based on mutually exclusive & exhaustive frameworks while accounting for national characteristics	Frameworks such as the OECD AI Framework incorporate goals like social well-being thus ensuring exhaustiveness while aligning with countries' goals e.g., of reducing poverty or improving healthcare
	5.2 Cater AI laws to national regulatory playing fields in a way that minimizes complexity and administrative burdens	Aligning AI laws with local socio-economic contexts (e.g., data privacy, employment laws) helps address specific affordability and access needs while ensuring they do not overburden the local institutions

4.2 Weak institutional capacity	5.3 Inform stringency of AI laws through international standards	Leveraging globally recognized frameworks (e.g., ISO) helps reduce the resource burden of developing entirely new regulations
	5.4 Implement single tech compliance office to enforce AI laws – nationally or across regions	Establishing clear and centralized enforcement mechanisms helps compensate for limited institutional resources and regulatory fragmentation
4.3 Commitment and stability issues	5.3 Inform stringency of AI laws through international standards	Adopting globally tested standards to provide predictability and reliability in regulatory policies reduces investor uncertainty
	5.4 Implement single tech compliance office to enforce AI laws – nationally or across regions	Creating a single tech-compliance authority to ensure consistent AI enforcement ensures long-term stability & credibility while limiting costs
4.4 Greater vulnerability to corruption	5.1 Structure laws based on mutually exclusive & exhaustive frameworks while accounting for national characteristics	Structuring AI law based on a framework such as the OECD AI principles ensures aspects such as transparency and accountability are incorporated thus minimizing unethical or corrupt practices and collusion risks
	5.4 Implement single tech compliance office to enforce AI laws – nationally or across regions	A centralized authority reduces opportunities for corruption by streamlining accountability and oversight mechanisms while at the same time saving resources
4.5 Limited competition and market maturity	5.2 Cater AI laws to national regulatory playing fields in a way that minimizes complexity and administrative burdens	Adapting regulations to suit market realities ensures fair competition and addresses monopolistic tendencies that are typical for developing nations while making the market attractive to outside investment
	5.3 Inform stringency of AI laws through international standards	Promoting fairness and standardization in AI practices helps to encourage competition in less mature markets
4.6 Lack of skilled human resources	5.5 Establish Capacity-Building Programs for Regulators	Directly addressing the lack of expertise by promoting training programs and resource sharing helps build the regulatory skill base

5.1 Structure law based on mutually exclusive & exhaustive frameworks while accounting for national characteristics

The analysis of various laws pertaining to AI in developing countries such as South Africa or Nigeria as well as in industrialized nations such as Canada or the UK has shown that all components of the existing laws in scope can be mapped to common, mutually exclusive yet exhaustive AI safety and innovation frameworks. The most common framework for this is the OECD AI framework consisting of seven principles: Transparency; Human Oversight & Agency; Accountability; Technical Robustness and Safety; Diversity, Non-Discrimination & Fairness; Privacy and Data Governance; and

Social & Environmental Well-Being [24]: Ensuring transparency in AI systems builds trust among users and stakeholders, promoting wider acceptance and effective use of AI technologies [25]. Emphasizing human oversight ensures that AI systems remain under human control, preventing misuse and potential harm. Establishing accountability frameworks helps in identifying and addressing the responsibilities of stakeholders, ensuring ethical and lawful use of AI. Prioritizing technical robustness and safety reduces the risk of AI system failures and vulnerabilities, enhancing the reliability of AI applications [22]. Promoting diversity and fairness in AI systems helps in preventing biases, ensuring equitable outcomes for all segments of society. Strengthening privacy and data governance protects individuals' personal data, fostering a secure and trustworthy AI ecosystem [24]. Focusing on social and environmental well-being ensures that AI developments contribute positively to society and the environment, aligning with sustainable development goals. By fostering a fair, accountable, and adaptable regulatory framework, these principles help facilitate the continuous cycle of innovation and renewal, ensuring that AI technologies can drive sustainable economic growth and transformation [26].

Regulators in developing countries could use these principles to structure their AI law efforts and thereby ensure they are mutually exclusive yet exhaustive of technological needs as illustrated by other nations. At the same time regulators in developing nations could also use several of the principles such as social & environmental wellbeing to ensure that the laws address the distinct social and economic priorities that developing nations typically have such as reducing poverty and improving services. Ways to achieve this could be: 1. Make local hiring a requirement for any AI developments in the country thus increasing employment and reducing poverty; 2. Require firms developing AI tools to make their developments open source, so that they can be accessed by the wider community or 3. Force firms to prioritize AI developments that benefit healthcare practitioners.

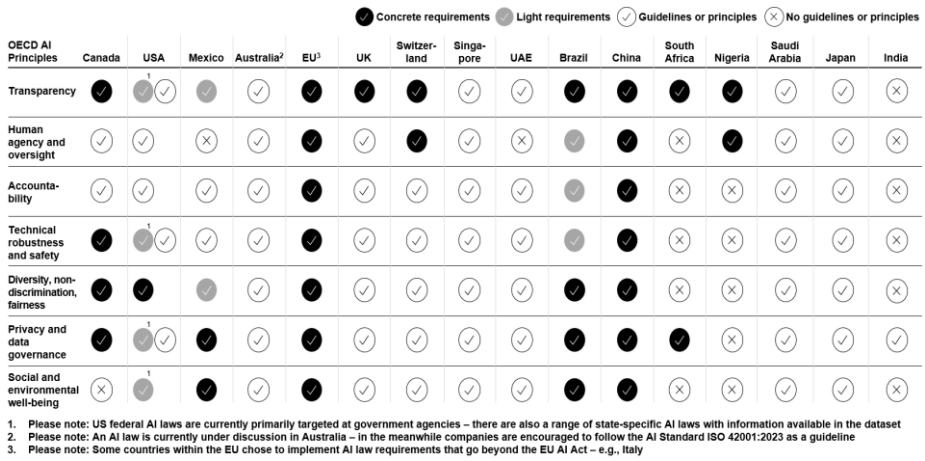

Fig. 1. Global AI regulation landscape mapped to OECD AI principles as of December 2024 based on a review of applicable laws gathered through an analysis of publications by regulatory bodies in the respective countries. Own figure – dataset including sources available upon request

5.2 Cater AI laws to national regulatory playing fields in a way that minimizes complexity and administrative burdens

The analysis of the various regulations showed that AI laws need to be seen in the context of other regulatory efforts in their respective nations – most importantly 1. Data privacy laws: Legal rules used to protect individuals' personal information from unauthorized access, use, or disclosure, ensuring the rights to privacy, control, and security of their data – e.g., the EU General Data Protection Regulation [27], 2. Intellectual property laws: Legal frameworks that protect rights of inventors over their inventions, designs, and creative works, providing them exclusive rights to use, sell, or license their creations – e.g., the UK Patents Act [28], 3. Cybersecurity laws: Legal regulations to protect IT systems, networks, and data from digital attacks, unauthorized access, or damage, and to prosecute cybercrimes – e.g., the Chinese Cybersecurity Law [29], 4. Employment laws: Laws that govern the relationship between employers and employees, covering wages, working conditions, discrimination, and safety – e.g., the Japanese Labor Standards Act [30], 5. Anti-discrimination laws: Regulations that prohibit unequal treatment or discrimination based on characteristics such as race, gender, age, religion, disability, and sexual orientation – e.g., the Swedish Anti-Discrimination Act [31] and 6. Contract laws: Laws that outline the elements required for a legally binding contract, the interpretation of contracts, and the remedies for breach of contract – e.g., the German Civil Code [32].

Regulators in developing nations need to ensure that their AI laws are developed within their respective law frameworks and ensure exhaustiveness while not creating significant overlap [13]. At the same time regulators can use this principle to ensure that law requirements are not overly complex and do not overburden the local regulatory infrastructure with unnecessary requirements [3]. This could mean the following: 1. Design a joint set of rules for related topics such as Data Privacy and Artificial Intelligence thus reducing the overall governance needs and 2. Instead of separate reporting mechanisms for companies across various fields of regulation, create singular reporting platforms that cover various requirements such as AI, Data Protection, Anti-Trust Requirements and others.

5.3 Inform stringency of AI laws through international standards

The analysis of countries approaches towards AI regulation shows varying stringency of laws (see figure 1). Similarly, regulators in developing nations need to make a choice concerning the stringency of the imposed rules: They could follow examples by regions such as the European Union where the usage of certain AI use cases such as social scoring is prohibited and highly impactful AI use cases in the medical sector, critical infrastructure sector and in public governance are closely reviewed. Alternatively developing nations could follow countries such as Singapore, the UAE and Saudi Arabia which only provide a set of guidelines for organizations to follow (see figure 1). To facilitate this decision governments of several countries such as Australia currently rely heavily on a globally established sets of standards such as ISO 42001:2023 or NIST AI RMF which inform stringency of the rules [33].

Developing nations could use standards such as the ones outlined in Table 2 in their design of AI regulations to inform how stringent the AI laws should be. This would allow for a tested set of frameworks that can be catered in stringency depending on specific needs. E.g., in case a developing nation is heavily reliant on the oil sector, corresponding binding guidelines could be established for this specific sector based on the NIST AI RMF that incorporates its tested risk measurement approach. This approach would also make it easier for international firms familiar with the framework to enter the developing country in question, bring business into the economy and thus increase employment and reduce poverty.

Table 2. Overview of international standards on artificial intelligence as of December 2024 based on a review of publications by established standardization bodies

Standardization body	Name of the AI Standard	Description of the AI Standard
The US National Institute of Standards and Technology (NIST)	AI Risk Management Framework (AI RMF)	Covers four core AI Risk functions: with suggested actions: Govern (cultivating a culture of risk management); Map (recognizing context and associated risks); Measure (measuring risks); Manage (prioritizing risks based on projected impact). The framework is aligned with ISO standards (e.g., ISO/IEC 5338 & DIS 42001)
The European Telco Standards Institute (ETSI) and the Committee for Standardization (CEN)	ETSI TR 104 031 ETSI GR SAI 009 CEN/ISO/TR 22100-5 CEN/ISO/TR 24027	The European Commission coordinates efforts together with CEN and ETSI – the European Standardization Organizations. Since 2022 a range of standards have been developed focused on safe machine learning practices, AI aided decision making, robustness of neural networks, autonomous systems, bias in AI systems and other topics. ETSI focuses on telecommunications and CEN on a range of industrial and consumer sectors.
The International Organization for Standardization (ISO)	ISO/IEC 42001: 2023 ISO/IEC 23894: 2023 ISO/IEC 23053: 2022	ISO/IEC 42001:2023 is a management system standard for policies and procedures for AI governance based on the Plan-Do-Check-Act method. ISO/IEC 23894:2023 is a guidance on how to manage AI specific risks and integrate risk management in AI related activities. ISO/IEC 23053:2022 establishes a framework for describing a generic AI system based on machine learning

5.4 Implement single tech compliance office to enforces AI laws – nationally or across regions

The review of AI laws has also shown that a range of nations are currently implementing compliance offices aimed at enforcing AI laws through regular audits and fines – e.g., the European Union is currently in the process of implementing such an AI office [4]. Blueprint for these offices are often the compliance offices executing upon banking regulation – e.g., the SEC in the United States or the BaFin in Germany [3].

While this is an advisable procedure for developed nations, given the limited resources that developing nations typically have it is advisable to bind enforcement mechanisms across technology regulations together [12]. By implementing a singular body for tech law compliance developing nations could ensure that organizations adhere to the imposed AI laws and maintain safety protocols while not taking up too many resources. Alternatively, groups of developing countries could coordinate to implement a single AI compliance office across an entire region – similar to the EU. This could be coordinated via bodies such as the African Union (AU) or the Association of Southeast Asian Nations (ASEAN).

5.5 Establish Capacity-Building Programs for Regulators

Lastly, the analysis of national press releases on artificial intelligence laws across several regions showed that many countries – and especially developing nations – face challenges in finding experts to staff their regulatory bodies for artificial intelligence [12]. This is critical as without a certain degree of knowledge on the technology – e.g., in the form of machine learning certifications and proficiency in Large-Language-Models (LLM) or Retrieval-Augmented-Generation (RAG) deployment – it is difficult for lawmakers to design and enforce appropriate laws pertaining to the technology [20].

To address this government officials in developing nations must instate initiatives to train regulators, attract skilled professionals, and establish knowledge-sharing partnerships with international organizations. This would enhance the technical expertise required for monitoring and enforcement, addressing institutional weaknesses specific to developing nations.

6 Concluding Discussion

This paper was motivated by the limitations many regulators in developing nations face when attempting to regulate the multifaceted landscape of AI in a way that promotes innovation while ensuring safety and fairness under consideration of the characteristics, limitations and goals of their respective nations. By addressing this issue this paper provides several theoretical and practical contributions:

6.1 Theoretical Contributions

The six characteristics of developing nations outlined in chapter 4 contradict the prospective sensemaking theory of abstraction and elaboration authored by Seidel et al. by exposing its underlying assumptions about institutional capacity, stability, and stakeholder engagement [14]. The theory presumes robust institutional frameworks to enforce abstract principles and detailed roles, yet weaker institutional capacity in developing nations undermines the ability to operationalize these abstractions effectively. Similarly, the theory's iterative, future-oriented process relies on regulatory stability and long-term commitments, which are often absent in politically volatile contexts. Moreover, its emphasis on fostering innovation through technology neutrality is

misaligned with the immediate social and economic priorities of developing nations, which prioritize basic needs over innovation. Corruption further distorts the collaborative processes required for effective elaboration, while limited market maturity renders technology-neutral regulations ineffective in stimulating competition or addressing monopolistic dynamics. These systemic challenges highlight the inapplicability of the theory in contexts where foundational regulatory preconditions are weak or absent.

Building on this insight, the five design principles identified in this study also challenge and refine Seidel et al.'s [14] theory of collective prospective sensemaking. By applying and adapting their abstraction and elaboration processes to the regulatory contexts of developing nations, this research highlights that the success of such approaches hinges on addressing the distinct socio-economic and institutional realities of these regions. For example, while Seidel et al. emphasize technology-neutral frameworks, this study underscores the need for regulatory specificity for technologies in developing contexts to address immediate risks and institutional constraints.

Furthermore, the five design principles build on and extend Estache and Wren-Lewis's [11] theory of regulation in developing countries. While Estache and Wren-Lewis highlight the unsuitability of traditional regulatory models due to institutional weaknesses such as limited capacity and high degrees of corruption, this research effort addresses these challenges by offering specific strategies tailored to the complexities of AI governance. For example, the outlined principles emphasize integrating global AI standards and frameworks to offset capacity limitations and foster consistency while maintaining the flexibility and simplicity advocated by their theory. However, this study also differs by critiquing some of their proposed solutions, such as creating multiple regulatory agencies or high-powered incentives, which may not be directly applicable to AI governance due to its reliance on rapidly evolving technologies and global interdependence. Instead, this study advocates for a centralized compliance office to streamline enforcement and enhance accountability—a refinement to their focus on institutional simplicity and achievable goals. By adapting their framework to address the unique regulatory needs of AI, this research bridges gaps in their theory and offers a modernized approach that balances accountability, innovation, and contextual adaptability in developing countries.

6.2 Practical Contributions

This study provides a comprehensive approach for regulators to AI governance in developing countries that balances the need for innovation, safety and country-specific characteristics. By following the five design principles outlined above regulators will be able to develop high-quality AI laws in a time- and cost-efficient manner that 1. align with social and economic priorities such as poverty reduction and improvement of basic services, 2. are executable even under circumstances of limited regulatory capacity, 3. account for limited government stability, 4. account for corruption-risks, 5. account for limited market maturity and 6. consider limitations concerning the availability of skilled AI regulation experts.

6.3 Limitations and Future Research Directions

While the outlined principles provide valuable insights for the design of AI regulation in developing nations, they have limitations thus creating opportunities for additional research: Firstly, the reliance on publicly available documents and standards might not capture the full scope of informal practices and guidelines that also influence AI governance thus leaving room for future studies. Secondly, the field of AI regulation is continuing to develop rapidly – analyzing more empirical data of additional developing countries looking to implement AI laws e.g., in the context of a future second research effort to cover the last echelons of Tuunanen's eDSR Methodology [16] would help to specify the principles further. Thirdly, an assessment of how different AI regulatory frameworks impact innovation and economic growth, leveraging econometric models to provide robust evidence could also be helpful to practitioners [34].

Additionally, comparative studies could examine the effectiveness of AI laws across diverse cultural and political contexts, highlighting best practices and areas for improvement [35]. Another valuable avenue would be the investigation of the interplay between AI regulation and market structures, drawing on theories such as market failure [36] and regulatory capture [37]. Research could also expand on the role of private sector self-regulation and non-state actors in shaping AI governance, providing a more holistic view of the regulatory landscape. Finally, integrating insights from behavioral economics [38] could enhance our understanding of how individuals and organizations respond to AI regulations, leading to more effective policy design. Addressing these research opportunities would advance our understanding of AI regulation impact on developing nations and innovation even further.

References

1. Berente, N., Gu, B., Recker, J., Santhanam, R.: Managing Artificial Intelligence. MIS Quarterly. (2021). https://doi.org/10.25300/MISQ/2021/16274
2. Floridi, L., Cowls, J., Beltrametti, M., Chatila, R., Chazerand, P., Dignum, V., Luetge, C., Madelin, R., Pagallo, U., Rossi, F., Schafer, B., Valcke, P., Vayena, E. AI4People—An ethical framework for a good AI society: Opportunities, risks, principles, & recommendations. Minds and Machines, 28, 689-707. (2018). https://doi.org/10.1007/s11023-018-9482-5
3. Cath, C., Wachter, S., Mittelstadt, B., Taddeo, M., Floridi, L.: Artificial intelligence and the 'good society': The US, EU, and UK approach. Science and Engineering Ethics, 24, 505-528. Springer Netherlands (2018). https://doi.org/10.1007/s11948-017-9901-7
4. European Commission: Regulation on a European approach for artificial intelligence. Brussels: European Commission. (2024). https://digital-strategy.ec.europa.eu/en/policies/regulatory-framework-ai.
5. Russell, S., & Norvig, P.: Artificial intelligence: A modern approach (3rd ed.). Pearson (2016). https://people.engr.tamu.edu/guni/csce421/files/AI_Russell_Norvig.pdf
6. Almeida, P., de Santos, C., & Farias, J.: Artificial Intelligence Regulation: A framework for governance. Ethics and Information Technology, 23(5), 505-525 (2021). DOI: 10.1007/s10676-021-09576-2. https://doi.org/10.1007/s10676-021-09593-z

7. Li, C.: Global push to regulate artificial intelligence. World Economic Forum (2023). https://www.weforum.org/agenda/2023/05/top-story-plus-other-ai-stories-to-read-this-month/
8. Roberts, H., Cowls, J., Morley, J., Taddeo, M., Wang, V., Floridi, L.: The Chinese approach to artificial intelligence: An analysis of policy, ethics, and regulation. AI & Society, 36(1), 59-77. (2021). https://doi.org/10.1007/s00146-020-00992-2
9. Erdélyi, O. J., Goldsmith, J.: Regulating artificial intelligence: Proposal for a global solution. Proceedings of the 2018 AAAI/ACM Conference on AI, Ethics, and Society (2018). https://doi.org/10.1145/3278721.3278731
10. Demaidi, M.: Regulatory Frameworks for Emerging Technologies in Developing Countries. AI & Society, 15(2), 45-60. (2023). https://doi.org/10.1007/s00146-023-01779-x
11. Estache, A., Wren-Lewis, L.: Toward a Theory of Regulation for Developing Countries: Following Jean-Jacques Laffont's Lead. Journal of Economic Literature, 47(3), 729-770. (2009). https://doi.org/10.1257/jel.47.3.729
12. Cooreman, H., Zhu, Q.: Critical reflections on the ethical regulation of AI: Challenges with existing frameworks and alternative regulation approaches. IEEE International Symposium on Technology and Society (ISTAS) (2022). https://doi.org/10.1109/istas55053.2022.10227116
13. United Nations AI Advisory Board: Governing AI for Humanity: Final Report. (2024). https://www.un.org/sites/un2.un.org/files/governing_ai_for_humanity_final_report_en.pdf
14. Seidel, S., Frick, C., vom Brocke, J.: Regulating Emerging Technologies: Prospective Sensemaking through Abstraction and Elaboration (2024). https://doi.org/10.25300/MISQ/2024/18039
15. Nugraha, T.: The Urgency of AI Regulation for Developing Countries. Modern Diplomacy. (2024a). https://moderndiplomacy.eu/2024/06/30/the-urgency-of-ai-regulation-for-developing-countries-insights-from-indonesia/
16. Tuunanen, T., Winter, R., vom Brocke, J.: Dealing with Complexity in Design Science Research: A Methodology Using Design Echelons. MIS Quarterly. (2024). https://doi.org/ DOI: 10.25300/MISQ/2023/16700
17. Peffers, K., Tuunanen, T., Rothenberger, M., Chatterjee, S.: A design science research methodology for information systems research. Journal of Management Information Systems, 24(3), 45-77 (2007). https://doi.org/10.2753/MIS0742-1222240302
18. United Nations Department of Economic and Social Affairs: Country Classification – Data Sources and Aggregation Methodology (2014). https://www.un.org/en/development/desa/policy/wesp/wesp_current/2014wesp_country_classification.pdf
19. Hevner, A., Chatterjee, S., Iivari, J.: Twelve theses on design science research in information systems. Design Research in Information Systems: Theory and Practice, 43-62 (2010). https://doi.org/10.1007/978-1-4419-5653-8_5
20. Floridi, L., Holweg, M., Taddeo, M., Amaya, J., Mökander, J., Wen, Y.: capAI - A procedure for conducting conformity assessment of AI systems in line with the EU Artificial Intelligence Act. University of Oxford - Saïd Business School (2022). https://doi.org/10.2139/ssrn.4064091
21. Hacker, P.: Sustainable AI regulation. Privacy Law Scholars Conference (2023). https://doi.org/10.48550/arXiv.2306.00292
22. Krogh, G., Roberson, Q., Gruber, M.: Recognizing and Utilizing Novel Research Opportunities with Artificial Intelligence. Academy of Management Journal. Vol. 66, No. 2 (2023). https://doi.org/10.5465/amj.2023.4002

23. Nugraha, T.: Barriers to AI Regulation in Southeast Asia: An Overview. Southeast Asian Journal of Law and Policy, 12(1), 88-112 (2024b). https://doi.org/10.3389/frai.2024.1411838
24. OECD: AI Principles. Organization for Economic Co-operation and Development (2019). https://www.oecd.org/en/topics/sub-issues/ai-principles.html
25. Chen, J., Zacharias, J.: Design Principles for Collaborative Generative AI Systems in Software Development. In DESRIST Conference 2024 Proceedings (2024). https://doi.org/10.1007/978-3-031-61175-9_23
26. Glikson, E., Woolley, A.: Human trust in artificial intelligence: Review of empirical research. Academy of Management Annals, 14(2) (2020). https://doi.org/10.5465/annals.2018.0057
27. European Commission: Data Protection in the EU (2016). https://commission.europa.eu/law/law-topic/data-protection_en.
28. UK Government: The Patents Act (1977). https://www.gov.uk/government/publications/the-patents-act-1977
29. National People's Congress of the People's Republic of China. Cybersecurity Law of the People's Republic of China. (2017). http://www.chinalawtranslate.com/cybersecurity-law/?lang=en.
30. Ministry of Health, Labour and Welfare of Japan: Labour Standards Act (1947). https://www.mhlw.go.jp/english/policy/employ-labour/labour-standards/index.html.
31. Government Offices of Sweden. Anti-Discrimination Act (2008). https://www.do.se/choose-language/english/discrimination-act-2008567#:~:text=The%20purpose%20of%20this%20Act,disability%2C%20seual%20orientation%20or%20age.
32. BGB. Deutsches Bürgerliches Gesetzbuch (2002). https://www.gesetze-im-internet.de/englisch_bgb/englisch_bgb.html
33. Standards Australia: Australia adopts the international standard for AI Management Systems (2024). https://www.standards.org.au/news/standards-australia-adopts-the-international-standard-for-ai-management-system-as-iso-iec-42001-2023
34. Aghion, P., Howitt, P: A Model of Growth Through Creative Destruction. Econometrica 60(2), 323-351 (1992). https://doi.org/10.2307/2951599
35. North, D.: Institutions, Institutional Change and Economic Performance. Cambridge University Press (1990). https://doi.org/10.2139/ssrn.1416542
36. Stiglitz, J.: Markets, Market Failures, and Development. American Economic Review, 79(2), 197-203 (1989). https://doi.org/10.3386/w2961
37. Stigler, G.: The Theory of Economic Regulation. The Bell Journal of Economics and Management Science, 2(1), 3-21 (1971). https://doi.org/10.2307/3003160
38. Kahneman, D., Tversky, A.: Prospect Theory: An Analysis of Decision under Risk. Econometrica, 47(2), 263-291 (1979). https://doi.org/10.2307/1914185