



12. Socio-Institutional Adaptation in the Integration of Generative AI Across Caribbean Higher Education

Adaptación socioinstitucional en la integración de la IA generativa en la educación superior del Caribe

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ABSTRACT

The article analyses the integration of generative artificial intelligence (AI) in Caribbean higher education as a process of socio-institutional adaptation, rather than a linear trajectory of technological adoption. Drawing on comparative evidence from Anglophone, Francophone, and Hispanophone Caribbean contexts, it demonstrates how universities actively reinterpret global AI paradigms in response to structural constraints, including climate vulnerability, infrastructural asymmetries, funding limitations, linguistic diversity, and persistent social inequalities. Higher education institutions emerge as pivotal mediating actors, embedding generative AI within learner-centred and hybrid pedagogical models that foreground critical thinking, ethical reasoning, and sustained human oversight. Beyond the education sector, AI is mobilised as a cross-cutting strategic lever supporting disaster risk reduction, precision agriculture, public health, workforce transformation, and public governance, thereby reinforcing its contribution to the Sustainable Development Goals. Haiti is strategically used to illustrate how, even in contexts of extreme fragility, contextualized training in generative AI and prompt engineering can foster innovation, social impact, and transnational academic cooperation. The analysis advances a normative argument that successful AI integration requires minimum institutional capacity, robust data governance, clear regulatory and ethical frameworks,

and strengthened regional coordination. It concludes that Caribbean universities are not passive recipients of technological change but active architects of locally grounded digital futures, leveraging generative AI to enhance societal resilience, reduce structural inequalities, and inform context-sensitive public policy design.

Keywords: Digital transformation in Caribbean higher education; Caribbean AI governance and regulation; Human-centred and ethical AI; Caribbean digital policy coordination; Socio-institutional adaptation of Generative AI

Adaptación socioinstitucional en la integración de la IA generativa en la educación superior del Caribe

RESUMEN

El artículo analiza la integración de la inteligencia artificial (IA) generativa en la educación superior caribeña como un proceso de adaptación socioinstitucional, más que como una trayectoria lineal de adopción tecnológica. A partir de datos comparativos de los contextos anglófonos, francófonos e hispanohablantes del Caribe, demuestra cómo las universidades reinterpretan activamente los paradigmas globales de la IA en respuesta a limitaciones estructurales, entre las que se incluyen la vulnerabilidad climática, las asimetrías infraestructurales, las restricciones de financiación, la diversidad lingüística y las desigualdades sociales persistentes. Las instituciones de educación superior se perfilan como actores mediadores fundamentales, integrando la IA generativa en modelos pedagógicos híbridos y centrados en el alumno que ponen de relieve el pensamiento crítico, el razonamiento ético y la supervisión humana constante. Más allá del sector educativo, la IA se moviliza como una palanca estratégica transversal que respalda la reducción del riesgo de desastres, la agricultura de precisión, la salud pública, la transformación de la fuerza laboral y la gobernanza pública, reforzando así su contribución a los Objetivos de Desarrollo Sostenible. Se presta especial atención a Haití como ejemplo estratégico, ilustrando cómo, incluso en contextos de extrema fragilidad, la formación contextualizada en IA generativa y la ingeniería de respuestas rápidas pueden fomentar la innovación, el impacto social y la cooperación académica transnacional. El análisis plantea un argumento normativo según el cual la integración satisfactoria de la IA requiere una capacidad institucional mínima, una gestión de datos sólida, marcos normativos y éticos claros, y una coordinación regional reforzada. Concluye que las universidades caribeñas no son meras receptoras pasivas del cambio tecnológico, sino artífices activos de un futuro digital arraigado en el

contexto local, que aprovechan la IA generativa para mejorar la resiliencia social, reducir las desigualdades estructurales y orientar el diseño de políticas públicas adaptadas al contexto.

Palabras clave: transformación digital en la educación superior del Caribe; gobernanza y regulación de la IA en el Caribe; IA ética centrada en las personas; coordinación de políticas digitales en el Caribe; adaptación socioinstitucional de la IA generativa

Adaptação socioinstitucional na integração da IA generativa no ensino superior do Caribe

RESUMO

O artigo analisa a integração da inteligência artificial (IA) generativa no ensino superior caribenho como um processo de adaptação socioinstitucional, em vez de uma trajetória linear de adoção tecnológica. Com base em evidências comparativas dos contextos caribenhos anglófonos, francófonos e hispanófonos, ele demonstra como as universidades reinterpretam ativamente os paradigmas globais de IA em resposta a restrições estruturais, incluindo vulnerabilidade climática, assimetrias infraestruturais, limitações de financiamento, diversidade linguística e desigualdades sociais persistentes. As instituições de ensino superior emergem como atores mediadores fundamentais, incorporando a IA generativa em modelos pedagógicos híbridos e centrados no aluno que privilegiam o pensamento crítico, o raciocínio ético e a supervisão humana contínua. Além do setor educacional, a IA é mobilizada como uma alavanca estratégica transversal que apoia a redução do risco de desastres, a agricultura de precisão, a saúde pública, a transformação da força de trabalho e a governança pública, reforçando assim sua contribuição para os Objetivos de Desenvolvimento Sustentável. É dada atenção especial ao Haiti como um exemplo estratégico, ilustrando como, mesmo em contextos de extrema fragilidade, o treinamento contextualizado em IA generativa e engenharia de prompts pode promover inovação, impacto social e cooperação acadêmica transnacional. A análise apresenta um argumento normativo de que a integração bem-sucedida da IA requer capacidade institucional mínima, governança de dados robusta, marcos regulatórios e éticos claros e uma coordenação regional reforçada. Conclui que as universidades caribenhas não são meras receptoras passivas da mudança tecnológica, mas sim arquitetas ativas de futuros digitais com raízes locais, aproveitan-

do a IA generativa para aumentar a resiliência social, reduzir as desigualdades estruturais e orientar a elaboração de políticas públicas sensíveis ao contexto.

Palavras-chave: transformação digital no ensino superior caribenho; governança e regulamentação da IA no Caribe; IA centrada no ser humano e ética; coordenação das políticas digitais no Caribe; adaptação socioinstitucional da IA generativa

Adaptation socio-institutionnelle dans le cadre de l'intégration de l'IA générative dans l'enseignement supérieur des Caraïbes

RÉSUMÉ

Cet article analyse l'intégration de l'intelligence artificielle (IA) générative dans l'enseignement supérieur des Caraïbes comme un processus d'adaptation socio-institutionnelle, plutôt que comme une trajectoire linéaire d'adoption technologique. S'appuyant sur des données comparatives issues des contextes anglophones, francophones et hispanophones des Caraïbes, il montre comment les universités réinterprètent activement les paradigmes mondiaux de l'IA en réponse à des contraintes structurelles, notamment la vulnérabilité climatique, les asymétries infrastructurelles, les limites de financement, la diversité linguistique et les inégalités sociales persistantes. Les établissements d'enseignement supérieur apparaissent comme des acteurs médiateurs essentiels, intégrant l'IA générative dans des modèles pédagogiques hybrides et centrés sur l'apprenant qui mettent en avant la pensée critique, le raisonnement éthique et une supervision humaine continue. Au-delà du secteur de l'éducation, l'IA est mobilisée comme un levier stratégique transversal soutenant la réduction des risques de catastrophe, l'agriculture de précision, la santé publique, la transformation de la main-d'œuvre et la gouvernance publique, renforçant ainsi sa contribution aux Objectifs de développement durable. Une attention particulière est accordée à Haïti en tant qu'exemple stratégique, illustrant comment, même dans des contextes d'extrême fragilité, une formation contextualisée en IA générative et en ingénierie des prompts peut favoriser l'innovation, l'impact social et la coopération universitaire transnationale. Cette analyse avance un argument normatif selon lequel une intégration réussie de l'IA nécessite des capacités institutionnelles minimales, une gouvernance solide des données, des cadres réglementaires et éthiques clairs, ainsi qu'une coordination régionale renforcée. Elle conclut que les universités des Ca-

raïbes ne sont pas de simples destinataires passifs des évolutions technologiques, mais des architectes actifs d'un avenir numérique ancré localement, tirant parti de l'IA générative pour renforcer la résilience sociétale, réduire les inégalités structurelles et éclairer la conception de politiques publiques adaptées au contexte.

Mots clés: La transformation numérique dans l'enseignement supérieur des Caraïbes ; la gouvernance et la réglementation de l'IA dans les Caraïbes ; une IA éthique et centrée sur l'humain ; la coordination des politiques numériques dans les Caraïbes ; l'adaptation socio-institutionnelle de l'IA générative

1. INTRODUCTION

The integration of generative artificial intelligence (AI) across Caribbean higher education institutions is best understood not as a linear process of technological diffusion, but as a dynamic process of **socio-institutional adaptation**. Across linguistic and geopolitical sub-regions—Anglophone, Francophone, and Hispanophone—the modalities, objectives, and emerging results of AI integration reflect institutional responses to contextual constraints, development priorities, and governance structures (UNESCO, 2021; World Bank, 2023).

The article confirms that generative AI integration in Caribbean higher education constitutes a process of socio-institutional adaptation. The initiatives examined illustrate how universities function as mediating institutions, translating global technological innovations into contextually grounded strategies that prioritize equity, resilience, and sustainable development. In doing so, Caribbean institutions position themselves not as passive recipients of technological change, but as active agents shaping regionally responsive pathways of digital transformation. The study is anchored in an integrative and descriptive theoretical framework that combines perspectives from socio-technical systems theory, education policy and governance, and digital inclusion and capacity-building. These perspectives make it possible to interpret observed initiatives not as isolated experiments, but as part of broader socio-technical configurations aimed at strengthening educational systems and reducing structural inequalities. The objective is not to measure impact quantitatively, but to analyze configurations, strategies, and patterns of integration of generative AI within Caribbean higher

education systems. The observed initiatives reflect emerging models of educational innovation that balance global technological opportunities with regional priorities for equity, resilience, and sustainable development.

2. METHODOLOGY

To this end, the article adopts a transversal and hybrid research design, drawing on education policy analysis, socio-technical systems perspectives, and institutional governance studies. The methodological approach is qualitative and interpretive, reflecting the exploratory character of generative AI integration in Caribbean higher education systems, where standardized indicators and longitudinal data remain uneven or emergent. Rather than aiming at causal inference or comparative ranking, the analysis seeks to identify recurrent patterns of socio-institutional adaptation, focusing on governance arrangements, pedagogical models, partnership structures, and capacity-building strategies across diverse linguistic and geopolitical contexts.

The comparative framework privileges institutional configurations and policy alignment over national performance metrics, allowing for cross-contextual interpretation while preserving sensitivity to local constraints. Empirical material is drawn primarily from documentary analysis, including academic literature, policy documents, institutional reports, and project documentation produced by universities, regional bodies, and international organisations. These sources are complemented by contextual insights derived from sustained engagement with higher education initiatives in the region, which are analytically treated and systematically triangulated with publicly available materials. This design prioritizes analytical rigor, transparency, and policy relevance in line with internationally recognized standards for research informing public decision-making.

This interpretive qualitative approach supports the article's exploratory and policy goals. The comparison is structured around institutional roles, governance arrangements, pedagogical models, and partnership configurations rather than national performance rankings. The analysis goes beyond technological determinism to examine how universities, ministries, and regional actors jointly shape AI-enabled educational practices. It enables an examination of how generative AI initiatives align with broader policy priorities such as equity, resilience, sustainable development, and digital sovereignty, and this framework is particularly suited to the Carib-

bean context, where educational transformation through AI occurs within environments marked by structural constraints, institutional diversity, and strong socio-cultural specificities. Caribbean universities play a central role not only in skills formation but also in policy experimentation, international cooperation, and the contextual adaptation of global digital norms.

Data collection relies on two complementary sources. First, the study draws on secondary data, including academic literature, policy documents, institutional reports, project documentation, and publications from international organizations. These materials provide contextual information on regional education policies, digital transformation strategies, and AI-related initiatives across the Caribbean. Second, the study incorporates participant observation, grounded in the authors' direct involvement in AI-related academic cooperation, training programmes, and institutional capacity-building initiatives in the region. To ensure analytical balance, these observations are systematically triangulated with documentary sources.

3. CAPITALISING ON AI FOR CARIBBEAN DEVELOPMENT

Caribbean public and private higher education institutions are gradually developing a more aggressive approach towards high-tech, especially as those high-tech domains become increasingly accessible not only to researchers and professors but also to students. Data science, artificial intelligence, virtual and augmented reality, blockchain and cryptocurrencies, and the Internet of Things (IoT) are all today's "low-hanging fruits" that we should pick to have a chance to contribute to the production of wealth during the current and next decades.

The current dynamics of the integration of Generative AI in Caribbean education systems from the perspective of public policies, university initiatives, and training highlight the emergence of techno-educational models that make it possible to reconcile the sociolinguistic specificities that characterize the societies of the South with the need to unite localization and globalization in the digital spaces that are common to us. The urgency, in terms of university training, is to move from the injunction made to societies in the South to consume intangible goods to that of producing critical digital models of societies within them. The study highlights how crucial it is to have cross-sectoral partnership configurations, contextualized ethical regulations, and techno-pedagogical architects capable of ensuring that educational AI is implemented in an equitable and sustainable manner in

the Caribbean. Experience in the sub-region shows that AI can drive systemic transformation when integrated into shared governance, supported by skilled personnel, and tailored to Caribbean contexts.

In an environment marked by recurrent exposure to natural hazards, Caribbean States have increasingly mobilised AI technologies to optimize disaster preparedness, develop sophisticated predictive models, and strengthen post-disaster resilience capacities. The dynamics of regional cooperation have promoted the pooling of tools, data, and expertise in AI applied to emergency management. The integration of AI in forecasting and response systems has substantially improved risk management and reduced structural vulnerability - an integral aspect of the global Sustainable Development Goals.

Caribbean academic institutions and research centres have invested in collaborative research and development (R&D) programmes aimed at designing AI solutions adapted to local contexts. These initiatives cover strategic areas such as community-based health care, inclusive economic development, digitalization of agriculture, and robust public safety.

As the funding crisis in higher education continues, it is becoming increasingly clear that the wave of strategic and operational changes being undertaken by virtually every provider is reshaping the whole sector. The strategic integration of AI into key sectors such as precision agriculture (Deep Farm, Erasmus+), adaptive education, and proactive disaster management is part of a holistic vision. This approach aims to consolidate societal resilience, promote inclusive and sustainable growth, and ensure the digital transformation of Caribbean States in the face of the challenges of the twenty-first century. The World Bank sees AI as a transformational lever that not only modernizes education but also raises awareness among younger generations about critical global issues, including climate change, poverty, and social justice (World Bank, 2023; UNDP, 2022). AI can be mobilised to design personalized educational content, promoting critical thinking, civic engagement, and social innovation (OECD, 2021).

The strategic integration of generative AI in Caribbean education systems is an opportunity to strengthen the resilience of local societies and drive innovation. Nevertheless, this technological transition requires a clear regulatory framework, robust digital infrastructure, and equitable access to technologies (ITU, 2022). A concerted effort, implying in-service teacher training, the involvement of stakeholders (governments, universities, NGOs,

and the private sector), and regional and international cooperation, is essential. Initiatives such as the establishment of collaborative platforms and specialized AI incubators are key to developing sustainable local expertise and anchoring innovation in Caribbean realities

Several Caribbean higher education institutions are engaging in efforts to integrate artificial intelligence (AI) into academic and career pathways. The University of the West Indies (UWI), for example, has launched AI training programs and is developing partnerships with tech companies to foster digital learning (UWI, 2024). There are examples of institutional synergies that promote the adoption of AI, particularly through inter-university collaborations. ESIH in Haiti has designed its own comprehensive training programme on generative AI, with, as of today, more than 55 training operations in organisations from the public/private sector and international organisations as well. Furthermore, this programme has been integrated into the international catalogue of the Agence Universitaire de la Francophonie (AUF), opening a large window into Africa and the Middle East participants. More recently, Haitian instructors from Haiti (ESIH) were recruited by the African Union Commission (AUC) to train, in Lusaka (Zambia), a group of approximately 50 high-level stakeholders originating from 10 of the 55 AUC member countries on using generative AI tools for monitoring and reporting operations.

4. CARIBBEAN EDUCATION POLICIES AND AI FRAMEWORK

Within the Caribbean, AI is evolving beyond its role as a technological tool to become a strategic component of regional efforts toward digital sovereignty, ecological resilience, and post-pandemic recovery. Historically affected by multidimensional vulnerabilities - climatic, economic, sociopolitical, logistical - the region is now investing in AI as a cross-cutting lever for socio-technical reconfiguration. Caribbean governments are embarking on reforms to improve access, equity, and quality of education. The CARICOM Framework for Action recognises education as a lever for socio-economic development (CARICOM, 2020). SDG 4 ("quality education") is a priority for governments and mobilises efforts around education initiatives (UNESCO, 2021).

In several countries, schools are adopting content that focuses on critical thinking, social justice, and civic education. At the same time, initiatives related to educational technologies are emerging, with the gradual inte-

gration of digital literacy into curricula (World Bank, 2020). Although generative AI is not yet fully prevalent in education, its potential is increasingly recognised for supporting personalised learning, content creation, and automated assessments.

Some universities are setting up research centres dedicated to educational AI. In-service training programmes are developed to equip teachers. However, disparities in technological resources, internet access, and digital skills are limiting this progress. Partnerships between governments, NGOs, and international institutions are crucial to bridging these gaps. They provide resources, training, and support for innovation. A regional approach, both proactive and context-specific, remains essential for education to become a real lever for transformation.

4.1. AI in Caribbean Linguistic and Geopolitical Subregions

4.1.1. Anglo-Caribbean Institutions.

In the English-speaking Caribbean, the University of the West Indies (UWI), particularly through its Global Campus, illustrates a model of distributed and context-sensitive integration. Operating across multiple island states, UWI has embedded AI-related modules within undergraduate and post-graduate programmes (UWI Academic Programme Guide, 2023), organized regional AI conferences (UWI TV, 2024), and expanded multi-mode and online learning infrastructures through its regional campuses. Rather than merely introducing AI as a technical specialty, the institution has positioned it within broader regional priorities, including climate resilience and digital transformation (UWI, 2024).

This approach reflects adaptation to the structural realities of Small Island Developing States (SIDS), including geographic fragmentation and climate vulnerability. AI research and pedagogical initiatives frequently intersect with disaster risk reduction and environmental governance agendas, consistent with regional priorities highlighted in policy analyses (ITU, 2022). The Global Campus modality itself constitutes a socio-institutional adjustment, leveraging digital platforms to overcome territorial dispersion and unequal resource distribution across islands (UNESCO, 2021).

Many nations have adopted education policies that focus on equity, inclusion, and quality. The Caribbean Community (CARICOM) has put in place frameworks for education, recognizing education as a major vehicle for social transformation (CARICOM, 2020). Education is mobilised to respond to

issues such as poverty, inequality, or social unrest. In this context, school curricula emphasising critical thinking, civic education, and life skills are multiplying (UNESCO, 2021). Technology is playing an increasingly disruptive role in the accelerated transformation of education systems. Several Caribbean countries are launching initiatives to integrate digital tools into their programmes, but the pace varies depending on the means available (CBD, 2023). Digital literacy, considered essential to navigating a globalised economy, is becoming a key policy issue (World Bank, 2020). Although generative artificial intelligence is still in its infancy in the region, awareness is emerging about its potential benefits for adaptive learning, administrative simplification, or content creation.

The implementation of AI remains hampered by barriers: limited infrastructure, lack of teacher training, and insufficient teaching resources. However, positive steps are being taken to equip schools with modern tools for inclusive and innovative education. The UWI is playing a pioneering role in structuring a framework for responsible governance of AI, in line with Caribbean ethical and social issues (UWI TV, 2024). It coordinates an interdisciplinary network bringing together researchers, technology companies, and decision-makers. UWI's inaugural Caribbean AI Conference, held in July 2024 at its Five Islands campus, addressed themes of regenerative AI and digital innovation.

The event brought together regional and international leaders from academia, industry, and policymaking to explore collaborative approaches to Caribbean digital transformation. Additionally, the UWI Business School in Mona, Jamaica, hosts a Centre of Excellence for Digital Innovation. Other regional campuses are developing AI labs and benchmark postgraduate programs to support applied research and local skills training.

The UWI is central to the Caribbean AI ecosystem through its teaching activities, research initiatives, and partnerships. Although it does not rank among the world leaders in AI, its action remains significant in the specific context of the Caribbean (UWI, 2024). The following are some examples of UWI's action in the field: Continuing education is offered to educators to help them integrate AI into the classroom. Several campuses offer undergraduate and graduate programmes integrating modules in AI, data science, and computer science (UWI Academic Catalogue, 2023). The Centre for Advanced Resilience Technology (CART) on the Mona campus conducts applied research in AI; UWI regularly collaborates with other regional and international universities to develop technological innovation projects

(AUF Caraïbe, 2023) and works with the public and private sectors on projects to apply AI to health, agriculture, and governance. Regional projects explore the use of AI for disaster management and public health

Organisations such as the Caribbean Development Bank (CDB) and the Agence Universitaire de la Francophonie (AUF) have facilitated the creation of consortia to foster good practices and accelerate the responsible adoption of AI. These initiatives include the creation of personalized educational applications, intelligent assessments, immersive experiences, and AI interfaces, such as instructional assistance “chatbots” (AUF Caraïbe, 2023)

Similarly, the University of Trinidad and Tobago (UTT) demonstrates adaptation through its alignment of AI curricula with national modernisation and workforce transformation strategies. The broader regional context of digital economy reforms in the Caribbean (World Bank, 2020) situates AI integration within economic diversification efforts. In this setting, generative AI and data science are embedded in applied and engineering-focused programmes to support industry-oriented innovation, reflecting a national development logic rather than a replication of external academic models.

Art and AI are converging in artistic projects using the creative generation to stimulate citizen expression and encourage a better understanding of societal issues. Projects like *AI Caribbean Art* have allowed students to produce visual works inspired by environmental and social themes, fostering constructive community dialogue. Another prominent example is the *Artificial Intelligence + Carnival + Creativity* project, led by Dr. Vernelle A. A. Noel of Carnegie Mellon University, which merges AI, architecture, and digital heritage to create dance sculptures representing the spirit of Trinidad’s carnival (Noel, 2023).

4.1.2. Franco-Caribbean Institutions.

The Francophone Caribbean is at a pivotal moment in harnessing AI to drive social and economic development. However, countries face many challenges, including unequal digital infrastructure, lack of adequate legal frameworks, and the critical need for skilled professionals in AI and related fields. L’Université des Antilles, through its Martinique-Guadeloupe cluster, is introducing AI modules into its computer science and engineering courses. These programmes are often carried out in collaboration with French or European institutions as part of projects, for example, eHorizon Europe or ERASMUS+ (University of the West Indies, 2022). At the same time, gov-

ernments are starting to formulate innovation and digital transformation strategies. The development of regional strategic plans, such as that of the Territorial Collectivity of Martinique (CTM) for 2021-2027, integrates AI and digital axes (CTM, 2021).

Martinique and Guadeloupe are experiencing growth in the number of tech startups using AI in the smart agriculture, predictive tourism, and environmental monitoring sectors. Local companies are working to adapt technologies to regional cultural and linguistic needs, including through the development of systems that integrate Creole languages (Lavil AI, 2023). The startup ecosystem is still in the structuring phase, but players such as MartiniqueTech or GuadeloupeTech are strengthening the network of public institutions, universities, and companies. There are persistent challenges, such as limited access to high-speed Internet, high technology costs, and a scarcity of advanced training locally. However, grassroots dynamics are multiplying, with local organizations offering training workshops, hackathons, or open-source projects geared towards local development. These initiatives reflect a growing movement to make AI a lever for inclusion and resilience in the Francophone Caribbean.

In environmental matters, AI is being explored for the management of natural disasters, the preservation of biodiversity, and the monitoring of coastal risks. Projects such as those led by the Center for Research on Risks and Vulnerability (CERES) in Martinique integrate AI models for satellite data analysis and preventive management AI in telemedicine, computer-aided diagnosis, epidemic forecasting, and data analysis in public health, especially in remote areas. According to a study by the Economic Commission for Latin America and the Caribbean (ECLAC, 2021), these applications can reduce disparities in access to healthcare.

The experience of rapid development and training adaptation to the technology and tools in Haiti is fertile ground for study and deserves to be recorded and replicated in various contexts to support the most fragile populations in the Caribbean region. In Haiti, socio-institutional adaptation is particularly visible in the initiatives of the State University of Haiti (UEH), the University of Quisqueya, and the École Supérieure d'Infotronique d'Haïti (ESIH). At UEH, the introduction of a Prompt Engineering module within a masters' programme exemplifies contextualized AI integration. The pedagogical exercise—designing AI-assisted tools tailored to corporate social responsibility strategies in Haitian contexts—was explicitly aligned with local socio-economic realities marked by fragility and infrastructural con-

straints (UNESCO, 2021; World Bank, 2021). This reflects the UNESCO recommendation that AI in education be implemented through context-sensitive and equity-oriented strategies (UNESCO, 2021; Tuomi, 2023).

At ESIH, generative AI has been institutionalised through structured training programmes accessible to non-technical audiences and recognized by international partners such as the Agence Universitaire de la Francophonie (AUF, 2024). Initiatives such as the Erasmus+ Deep Farm project further demonstrate adaptation through sector-specific application, particularly in agriculture (FAO, 2022). By integrating AI tools into mango production in collaboration with UEH and European institutions, the programme links digital innovation to food security and sustainable agricultural development, aligning with regional priorities identified by FAO (2022) and ECLAC (2022).

The University of Quisqueya, operating within Haiti's mixed public-private higher education ecosystem, reflects a complementary adaptation dynamic. Within a competitive and resource-constrained environment, AI-related initiatives are incorporated into entrepreneurship and professional training pathways, reinforcing institutional resilience and alignment with private-sector modernization needs (World Bank, 2022).

4.1.3. Hispano-Caribbean Institutions.

In the Dominican Republic, higher education institutions such as the Universidad Autónoma de Santo Domingo (UASD), UNIBE, INTEC, and UTESA have integrated AI within broader national digital transformation agendas. The Government's Digital Agenda 2030 strategy (Gobierno de la República Dominicana, 2021) provides a policy framework encouraging technological modernisation and innovation ecosystems. Universities thus embed AI programmes within entrepreneurship, engineering, and digital economy initiatives, aligning academic transformation with national competitiveness strategies (OEI, 2021).

Public policies are also starting to support the local tech ecosystem. In the Dominican Republic, the "Dominicano de las Telecomunicaciones" Institute (INDOTEL) and the Ministry of Economy, Planning, and Development are supporting the creation of technological hubs and financing for startups through the "Digital Agenda 2030" strategy of the Government (2021).

In Cuba, the University of Havana and the Technological University of Havana (CUJAE) illustrate adaptation within a centralised governance model.

AI initiatives are linked to state-led modernisation programmes, including health informatics and national informatisation strategies. Despite infrastructural constraints and connectivity limitations, AI is framed within discourses of technological sovereignty and public system optimisation. This alignment with centralized planning structures demonstrates a distinct pathway of socio-institutional adaptation shaped by governance architecture rather than market dynamics.

In Puerto Rico, a territory of the United States, local dynamics are illustrated by the rise of innovative startups in the field of AI, often supported by universities such as the University of Puerto Rico (UPR) or incubators such as Parallel18. The “AI for Puerto Rico” program, for example, has supported the development of predictive tools in the fields of environment and health

Thus, although faced with resource and governance constraints, the Spanish-speaking Caribbean has great potential for the strategic integration of AI in the resolution of local problems. Strengthening synergies between universities, the private sector, and international partners could accelerate the structuring of this nascent ecosystem.

5. AI AND PUBLIC GOVERNANCE: TOWARDS REGIONAL REGULATION

The foundation of Caribbean public governance of AI is organized according to the principles of equity, algorithmic transparency, and digital inclusion, while UNESCO’s Roadmap (2023) calls for the establishment of national legal frameworks, the recognition of language rights in algorithmic systems, and coherent integration into education and health policies.

However, weak institutional capacity and disparities in access to data hinder fully operational regional regulation (World Bank & ILO, 2023), even as research, innovation and science diplomacy form a strategic Caribbean interface in which, between 2022 and 2025, the region consolidates its scientific capital in critical sectors including biotechnology through the Soberana and Abdala vaccines in Cuba, climate health via the joint CCCCC/PAHO strategy, and financial digitalization with Jam-Dex in Jamaica. The rise of digital education is supported by the UNICEF/World Bank alliance, marking a break in scale in the democratisation of knowledge and promoting the emergence of a triangular North-South-South science diplomacy in the context of open science.

At the same time, employment and professional transfers position AI as a lever for massive retraining as its introduction redefines the cognitive structure of work in BPOs (Business Process Outsourcing), tourism, cultural industries, and agribusiness sectors, where automation of repetitive tasks is accompanied by an enhancement of analytical, relational, and creative skills and where the World Economic Forum (2020) anticipates a net creation of 97 million jobs by 2025, subject to ambitious policies of continuous retraining (IDB, 2018) and a reconfiguration in the Caribbean that is based on hybrid models of learning and entrepreneurial innovation with territorial roots.

AI and climate further illustrate this trajectory as AI becomes part of a logic of anticipation of climate extremes by mobilizing advanced models for the prediction of hurricanes, droughts or submersions, with the use of Graph-Cast for Hurricane Lee prediction (RCI, 2023), satellite mapping of vulnerable areas in Dominica (GFDRR, 2023), and algorithmic optimization of irrigation in Grenada (IRRIGOPTIMAL) demonstrating the ability of AI to strengthen environmental governance, while its integration into energy management actively contributes to decarbonisation trajectories (PwC, 2019).

Agricultural AI and food sovereignty also advance towards data-driven agriculture as precision agriculture in the Caribbean increasingly leverages artificial intelligence to address local agricultural challenges through machine learning models that assist in evaluating soil quality, identifying early signs of crop stress or disease, and informing dynamic crop planning strategies tailored to regional conditions, generating efficiency gains in Barbados and the Dominican Republic while reducing the use of water and chemical resources, and embedding these practices within an agro-ecological paradigm of food sovereignty based on the valorization of data, with Haïti exemplifying this through the Consortium for the Erasmus+ Deep Farm project "UEH – FAMV", which includes the Ecole Supérieure d'Infotronique d'Haïti (ESIH) and the Faculté d'Agronomie et de Médecine Vétérinaire of the State University of Haiti (UEH), aiming to use Data Analytics and AI to modernize 2 preselected Haitian farms.

Across the Sustainable Development Goals, AI acts as a cross-cutting enabler serving as a foundational technology supporting progress across several SDGs in the Caribbean by facilitating improvements in healthcare access, enabling personalised learning, supporting the modernisation of infrastructure, contributing to environmental sustainability, and enhancing institutional governance capacities. Nevertheless, structural barriers persist

as the large-scale deployment of AI in the Caribbean remains hampered by the fragmentation of digital infrastructure, connectivity disparities, technical skills gaps, and lack of interoperable standards.

There is awareness in the region of the importance of building an equitable and sustainable ecosystem through integrated data governance, targeted education and TVET capacity building policies, consistent regulatory incentives, and regional pooling of resources. Furthermore, a strong data management strategy, governance, and infrastructure are a requirement to reach full AI readiness.

5.1. Generative AI: Catalyst for Social Development

Generative artificial intelligence offers considerable potential to catalyze social development, particularly in the areas of education, entrepreneurship, and public services. In a context marked by limited infrastructure and persistent socio-economic challenges, AI appears to be a key vector for improving access to digital educational resources adapted to local realities (UNESCO, 2021). For example, AI-based adaptive learning platforms can be deployed to personalize learning paths, which is essential in contexts where human and material resources are constrained (Tuomi, 2023).

In addition, AI applications facilitate the deployment of innovative solutions in key areas such as agriculture, health, and natural hazard management (World Bank, 2022). In agriculture, AI-powered tools enable predictive crop monitoring and optimized resource management, contributing to food security (FAO, 2022). In the field of health, AI models are used to strengthen remote diagnosis, a major asset in rural or hard-to-reach areas (WHO, 2021).

5.2. Generative AI Initiatives: The exemplary case of Haiti

Collaborative initiatives have emerged to promote contextual appropriation of these technologies in Haiti, facilitated primarily through the École Supérieure d'Infotronique d'Haïti (ESIH), which has consistently been promoting AI-related initiatives in Haiti starting as early as 2015, during the period of what is known as the AI winter.

The experience of rapid development and training adaptation to the technology and tools in Haiti is fertile ground for study and deserves to be recorded and replicated in various contexts, to support the most fragile populations in the Caribbean region.

Alliances such as those between Kairos-Educación (Asociación Académica Internacional para la Transformación Social y Responsable de la Educación), the AUF Caraïbe, ESIH, and the State University of Haiti (UEH) have made it possible to deploy innovative training courses integrating AI into educational engineering (Kairos nork). These partnerships are currently starting to lead to the creation of interdisciplinary programmes addressing the application of AI to education, encouraging an interactive and personalised approach to teaching (AUF Caraïbe, 2023). In 2024, ESIH and the University Mohammed Premier in Oujda, Morocco, partnered to promote a Bachelor degree in AI and Data Mining (<https://formation.auf.org/sessions/sessions-ouvertes/details-session/26?tab=0>), while in parallel, ESIH and ESTIA, an engineering school in France (<https://estia.fr>), have partnered to promote PhD-level studies in robotics, AI, and data analytics for Haitian students.

Preliminary evaluations conducted within partner institutions suggest a notable improvement in students' analytical skills and a growing adoption of digital tools. The central objective of these initiatives remains the training of highly qualified professionals, capable of integrating AI ethically and proactively into their professional practices, in line with the principles of inclusive and accountable technological governance (Floridi et al., 2018).

More recently, in a context marked by a multidimensional crisis in Haiti, the implementation of a university training in Prompt Engineering is an avant-garde educational initiative in the French-speaking Caribbean.

In 2024-25, State University of Haiti (UEH) Master of Education students created GPT assistants to support managers with CSR strategies tailored for Haiti. The proposed exercise consisted of "creating a CSR expert GPT to help a CSR manager of a company to develop a CSR strategy adapted to his company and its local environment".

The analysis of the ten submitted productions revealed a high level of appropriation of generative AI tools (including ChatGPT, SciSpace, Grok, Claude, and Gemini), articulated with a critical reflection on local social, economic, and environmental realities (Cyberclasse ESIH, 2024). The Prompt products were contextualized: inclusion of specific personas, consideration of structural constraints such as insecurity, inflation, and low connectivity, as well as alignment with the United Nations Sustainable Development Goals (SDGs). The targeted organisations ranged from educational SMEs to business foundations and rural NGOs. The main elements of the CSR strat-

egies proposed were their feasibility and societal impact: free tutoring in marginalized neighbourhoods, eco-design of educational materials, sustainable agriculture, and inclusive communication campaigns for MSMEs.

This initiative is part of a broader dynamic led by the École Supérieure d'Infotronique d'Haïti (ESIH), which has been designing and delivering qualifying in-person and online, tailor-made training in generative AI and Prompt Engineering since the beginning of 2023, immediately after the end of the AI winter. The initial programme, called "common core", consists of four online courses: vocabulary and concepts of generative AI, mastery of common models (ChatGPT, Grok, Claude, Gemini), content generation (image, audio, video), and prompt engineering techniques. Accessible in French and designed for non-technical profiles, this programme is continuously updated and is now referenced in the AUF's catalogue of qualifying training courses (ESIH, 2024; AUF, 2024). This success has led to the creation of thematic modules: "Generative AIs for research: the augmented researcher" and "Generative AIs for therapists". These courses aim to integrate AI in an operational way in various disciplines, strengthening learners' transversal skills (critical thinking, ethics, creativity, autonomy).

Another illustration of a longer and more elaborate collaborative endeavour is ESIH's involvement in the Deep Farm project, an ERASMUS+ funded project (<https://deepfarm.eu/>). It is a two-year project in which 8 higher education institutions from four third countries collaborate on four Use Cases (cocoa in the Ivory Coast, mango in Haiti, rice in Madagascar, and banana in the Dominican Republic) to enhance local capabilities in digital agriculture.

In the case of Haiti, four master's level students in Computer Science and Agriculture were selected in 2024 to attend an advanced theoretical training course in Data analytics and AI in Italy and France, within a mobility arrangement. They subsequently returned home to jointly develop local capabilities deploying AI tools, after having created a genuine monitoring app and combined efforts in the field to enhance Mango farming. These students' mandate also includes generating student awareness on the subject, and to this end, they are developing online training content (Gradeo) for future youth and actors in the Mango field.

Such a component has enabled the showcasing of exciting results and new cutting-edge capabilities to a young audience in compliance with Higher Education's mission of societal engagement, aimed at strengthening ties between universities and communities, particularly through inno-

vation and valorisation of knowledge. This has resulted in a vibrant inter-generational transmission and social impact. (Reported by Dr Marlene Sam, Director of International Cooperation and Partnerships, ESIH)

Despite the structural challenges of the Haitian education system (UNESCO, 2021), this approach illustrates that a gradual integration of AI is possible, provided that it is contextualised, inclusive, and supported by local institutions. Learners interviewed expressed great satisfaction with the originality and potential impact of the initiative in the Caribbean. By training a new generation of responsible professionals, this pioneering experience responds to a dual challenge: strengthening economic resilience and reducing social inequalities.

Unfortunately, Haiti, like many Caribbean nations, lacks the infrastructure to support the integration and deployment of advanced artificial intelligence (AI) technologies satisfactorily. It is therefore essential to invest in technological development and vocational training to meet these needs. This need is particularly pressing given that the current situation in Haiti is marked by deep instability and increased vulnerability, particularly because of the widespread violence perpetrated by armed groups, which affects most of the country's communities. The international community, especially CARICOM, has supported efforts to protect civilians.

The creation of institutional partnerships, such as those established in the Haitian Higher education ecosystem for the development of strategic AI skills, is essential to address regional socio-economic challenges. By harnessing these technologies responsibly and collaboratively, governments, NGOs and communities can promote a safer environment, improve quality of life, and drive economic development. AI technologies are increasingly employed by Caribbean security agencies to support crime prevention strategies. These tools not only improve threat detection but also contribute to safeguarding key economic sectors such as tourism by enhancing surveillance in high-traffic areas and facilitating smarter allocation of public safety resources.

Monitoring trends on social media can also help detect emerging threats, gang activity, or citizen perceptions of safety at an early stage. AI can analyse this data to foster community engagement and adjust social programmes accordingly. AI community needs assessments can also guide the mobilisation of mental health resources, helping to reduce violence related to psychological disorders. AI-facilitated data exchange and cross-border col-

laboration are essential in the fight against transnational crime that affects the entire Caribbean. As cybercrime poses a growing threat in the region, AI technologies offer powerful tools to detect and mitigate digital risks.

Local governments should also work with national and municipal authorities to align interventions with local priorities. Several universities and technical higher education institutions in Haiti and the Caribbean have already engaged in the development of programmes focused on AI and socio-economic stability. Community engagement is a fundamental pillar in the success of these programmes. It is essential to involve community leaders to ensure that AI strategies are culturally appropriate and respond to the real needs of populations. Local forums are recommended to address privacy issues and the ethical use of AI in public services.

6. AI AND CARIBBEAN EDUCATION SYSTEMS

The contribution of AI to the reform of education systems is neither a linear nor an automatic process. It requires certain essential prerequisites. Recent developments include the establishment of infrastructure networks open to all actors involved; an ambitious ethical policy; dynamic continuing education programmes; and local governance capable of supporting these developments.

The proper functioning of an AI-supported education system is mainly based on three fundamental pillars: encouraging students' critical thinking; fostering access to innovation through committed policies; and promoting human-centred ethics in its practical application. When these criteria are appropriately met, the field of Artificial Intelligence then moves beyond its mere role of utility to become a driver for more advanced cognitive justice and fostering economic development and social change within the Caribbean region.

Moreover, in recognising their role of being the vehicle, not the solution, Universities ought not to be prescriptive. Their role is to teach how to think and produce solutions, inform on best practices and productive strategies, and socialise solutions. University leadership also needs to be mindful that they are not divorced from the real world of work outside the University and consequently pursue the path of collaborative learning processes with transformative learning.

Taking into consideration that each country should aim to respond to its own conditions and priorities, the following policy recommendations may be useful if articulated as a coherent pathway:

Establish AI-in-Education Rules: Countries should adopt national or regional rules that embed equity, transparency, data protection, and the recognition of language rights (Creole, French, Spanish, and English). Implementation should be coordinated through regional bodies to encourage collaborative work and prevent institutions from acting alone out of fear of unethical AI use. This includes the potential creation of a National Data Governance and Protection Authority.

Invest in “Minimum Viable Capacity”: Higher education institutions must prioritize connectivity, devices, teacher professional development, and institutional capability through dedicated centers and programs. This ensures generative AI use genuinely improves teaching while drastically reducing access gaps across campuses and islands.

Fund and Scale Outcome-Oriented Pilots: Governments should support small-scale, evidence-seeking pilots focused on student support, innovative assessment redesign, and action-research initiatives with shared metrics. Best practices can then be scaled up through regional collaboration involving UWI, AUF, Ministries, and development partners to advance SDG4.

Create a Regional Governance Body: Finally, countries should consider creating a regional data governance body that encompasses data center infrastructures, regional massive training programs, and collaborative research.

7. CONCLUSION

Across the Caribbean, generative AI integration is consistently shaped by contextual determinants: climate vulnerability, economic restructuring imperatives, infrastructural asymmetries, linguistic diversity, and governance models. Institutions do not simply import global AI paradigms; rather, they recalibrate them in accordance with national policy frameworks (CARICOM, 2020), international guidelines on AI governance (UNESCO, 2021; ITU, 2022), and sustainable development objectives. The initiatives examined illustrate how universities function as mediating institutions, translating global technological innovations into contextually grounded strategies that prioritize equity, resilience, and sustainable development. In doing so, Caribbean

institutions position themselves not as passive recipients of technological change, but as active agents shaping regionally responsive pathways of digital transformation.

This analysis of the progress made in integrating generative artificial intelligence (AI) into Caribbean education systems highlights a remarkable opportunity for the region. Instead of simply being a classic technological advancement, generative artificial intelligence stands as a disruptive and accessible catalyst for structural reform, capable of helping to reduce cognitive gaps and strengthening the capacity of the youth, a fundamental segment of Caribbean societies,

to create meaning and understanding. It also strengthens the capacity of these societies to address various current challenges, such as security, natural disasters, and economic fragility. The study of the various cases highlights the importance of adopting adapted approaches that integrate elements of pedagogical innovation, social justice, and development while framing the use of digital technologies in the educational field.

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