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Leveraging Artificial Intelligence (AI) to Improve Trade and Commerce Efficiency in Guyana

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Abstract

The "Digital Guyana" initiative centers on AskGov, an AI platform providing 24/7 consultancy to bridge the gap between remote entrepreneurs and central regulation. By simplifying complex filings like the Local Content Act via mobile devices, the government ensures small businesses can navigate legal frameworks previously accessible only to large firms. Once integrated, these businesses leverage predictive logistics to align production with global demand. Agencies like the GRDB and GuySuCo use AI-equipped drones and modeling to monitor crop health, reducing chemical waste by 15% and stabilizing supply chains against seasonal constraints. This precision is mirrored in the oil and gas sector. Digital Twins on vessels like the Liza Unity optimize maintenance through real-time virtual modeling, while AI-powered underwater vehicles provide high-resolution seabed mapping for low-impact resource extraction. Industrial efficiency further drives SME growth via modernized financial services. Institutions like Republic Bank now use AI credit scoring to analyze non-traditional data, unlocking capital for businesses without formal credit histories. This allows manufacturers like DDL to adopt dynamic pricing tools for international competition. Further, to ensure ethical growth, the EPA utilizes real-time AI monitoring to track offshore production and waste. By automating Local Content Act compliance, the government ensures expansion translates into fair employment for the Guyanese workforce. Finally, advancements are secured within Silica City, where 3D AI models of power grids and drainage systems predict koker/sluice failures, ensuring infrastructure remains resilient against climate change.

Keywords: *AskGov, Degital Twins, Local Content, Predictive Logistics, Silica City.*

Introduction

The Digital Guyana initiative represents a strategic shift toward an agentic, AI-driven economy designed to bridge the gap between complex regulatory frameworks and operational execution. This research explores how platforms like AskGov and Digital Twin technologies are transforming Guyana's primary sectors by automating administrative tasks and optimizing industrial performance. By analyzing the integration of machine learning in the oil, gas, and agricultural sectors, this study evaluates the synergy between government-led digital consultancy and private-sector technological investment.

Central to this transformation is the empowerment of Small and Midsize Enterprises (SMEs) through modernized financial and logistical tools. The findings highlight how AI-driven credit scoring and predictive demand forecasting are dismantling traditional barriers to market entry, allowing local businesses to compete on an international scale. As Guyana navigates rapid economic expansion, this research sets the stage for assessing how these AI applications simultaneously drive industrial efficiency,

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ensure environmental stewardship, and reinforce the mandates of the Local Content Act.

Purpose of the Study

This study analyzes how AI-driven platforms like AskGov and Digital Twins bridge the gap between Guyana's regulatory frameworks and industrial execution. It evaluates the synergy between government digital initiatives and private-sector investment to optimize efficiency in the oil, gas, and agricultural sectors while ensuring compliance with the Local Content Act.

Furthermore, the research evaluates how AI-driven tools, including credit scoring for SMEs and Digital Twin modeling, optimize operational efficiency, foster inclusive innovation, and ensure strict adherence to the Local Content Act and environmental mandates to support Guyana's long-term economic and ecological sustainability

Research questions

1. How does the integration of agentic AI platforms like "AskGov" and digital twins affect operational efficiency and regulatory compliance in Guyana's primary economic sectors?
2. To what extent do AI-driven credit scoring and predictive logistics empower Guyanese SMEs to compete in international markets?

Material and Methods

The following approaches were utilized to synthesize secondary sources for understanding the impact on Trade and Commerce in Local Industries in Guyana:

Literature Review

A comprehensive review of scholarly articles, government reports, and industry publications was conducted to establish a theoretical framework for AI's role in trade and local content. This process synthesized global digital transformation trends with Guyana's specific regulatory environment, focusing on how machine learning enhances compliance and supply chain resilience.

Data Collection

Primary and secondary data were integrated from policy documents, business reports, and industry experts. Primary insights were gathered through virtual interviews with oil and gas stakeholders and SME representatives, providing a firsthand perspective on AI adoption hurdles, credit access, and the practical utility of agentic platforms like AskGov.

Data Analysis

To contextualize Guyana's progress, the study utilized a Comparative Benchmarking approach, analyzing AI adoption in nations like Norway, the UAE, and Singapore. The analysis focused on Sectoral Maturity Mapping, comparing Guyana's use of Digital Twins on the Liza Unity and autonomous drilling to global standards in the North Sea. By benchmarking the AskGov initiative against digital government models in "AI-first" states like Estonia, the research identified how natural language processing can specifically bypass traditional infrastructure bottlenecks to provide 24/7 regulatory guidance.

The study further employed an SME Scalability Assessment, evaluating how AI-driven credit scoring models, similar to those used in other emerging markets can bridge the "finance gap" for local contractors.

Synthesis and Interpretation

The collected data were synthesized to identify critical trends, systemic challenges, and high-impact opportunities for AI within Guyana's trade and commerce sectors. By correlating qualitative interview insights with quantitative industry reports, the study mapped the direct impact of automation on market competitiveness and supply chain reliability.

The findings were interpreted through the lens of local economic policies, such as the

Local Content Act and the Low Carbon Development Strategy (LCDS). This ensured that the conclusions remained grounded in Guyana's specific industrial needs, focusing on how AI-driven tools like AskGov and Digital Twins align with national mandates for transparency, SME inclusivity, and sustainable resource management.

Discussion/Findings

As part of the broader "Digital Guyana" initiative, the government has developed AskGov, an agentic AI-powered platform designed to serve as a 24/7 digital consultant for citizens and businesses. Trained on local regulatory frameworks like the Local Content Act and national tax structures, the tool allows entrepreneurs to navigate complex administrative processes, such as registering for the oil and gas supply chain, using simple, natural language queries [34]. By providing remote accessibility via mobile devices [35]. Within this context, the following 'sub-headings were framed and discussed: -

Predictive Logistics (Demand Forecasting in Agriculture, Retail, and Fuel)

According to Abayomi and Thomas [3], Artificial Intelligence (AI) can predict market demand and supply fluctuations by analyzing historical sales data, weather trends, and consumer behaviour. In Guyana's agricultural sector, AI can analyze historical data on rice and sugar production along with weather patterns to predict future yields and demand. This can help farmers and exporters optimize storage, reduce waste, and meet market needs efficiently.

For example, the Ministry of Natural Resources in Guyana has launched a landmark AI-powered mineral mapping project covering the country's Shield [33]. By utilizing machine learning to analyze historical geological data alongside new hyperspectral aerial surveys, the project identifies high-potential deposits of gold and rare earth elements [33]. This reduces the environmental impact of traditional "prospecting" and ensures that the government can negotiate more favorable terms with international mining firms based on precise resource data [33].

Companies such as [1]*ExxonMobil* have employed AI in offshore drilling operations, demonstrating its potential in Guyana. These applications focus on improving operational efficiency, predictive maintenance, and real-time monitoring of oil production. For example, in collaboration with [2]*Aize and* [3]*SBM Offshore*, the company deployed digital twin software on the Liza Unity and Liza Destiny FPSO vessels. These virtual models integrate real-time data from multiple sources, improving predictive maintenance, turnaround activities (TAR), and operational planning, directly improving commerce efficiency in Guyana's primary economic driver [1].

Additionally, ExxonMobil partnered with [4]*Ocean Infinity* to conduct high-resolution seabed mapping within the Stabroek Block using AI-powered autonomous underwater vehicles (AUVs). Covering approximately 3,100 square kilometres at depths of 70 to 2,150 meters, these surveys enhance geological and geotechnical understanding while minimizing risks and environmental impact [21].

To support these findings, we look at the work of LeewayHertz [18], who posits that AI-based demand forecasting models improve

[1] ExxonMobil is one of the largest integrated fuels, lubricants, and chemical companies in the world, managing a leading portfolio of resources. It also holds significant positions in high-growth commodity petrochemical and polymer products.

[2] Aize is an industrial software company that provides tools for users to visualize, navigate, collaborate, and work on digital representations of assets.

[3] SBM Offshore is a global leader in offshore energy solutions, focusing on innovative floating production systems and services for the oil and gas industry.

[4] Ocean Infinity is a technology company that develops innovative robotic technology aimed at transforming maritime operations to enhance sustainability for both people and the planet.

supply chain efficiency by analyzing real-time and historical data, helping businesses optimize inventory and reduce stockouts. This approach can apply to supermarkets, agricultural producers, and fuel distributors in the country. For example, AI-driven demand forecasting can predict which products will be in high demand based on trends, seasons, and consumer behaviour. This prevents stockouts (which lead to lost sales) and overstock (which leads to waste).

Further, Guyana's supply chain is affected by transportation constraints, including limited infrastructure in some regions. AI can predict demand and optimize inventory distribution, ensuring that goods are available where they are needed. Additionally, since Guyana imports many consumer goods, AI can help supermarkets adjust their orders based on currency fluctuations, import delays, and local production capacity. Already, the government is looking at expanding the GRDB drones and GuySuCo modeling to act as the "eyes" of the supply chain in all sectors.

To further improve oversight and regulatory compliance, ExxonMobil, in collaboration with the Guyanese [5]Environmental Protection Agency (EPA), has deployed AI-powered measuring instruments on FPSO vessels. These devices provide real-time production monitoring by continuously tracking oil output and uploading data to a cloud-based system. This technology enables authorities to monitor every barrel produced and ensures proper disposal of produced water, reinforcing environmental responsibility in offshore operations [14].

Walmart, one of the largest retailers in the world, uses AI-based demand forecasting to optimize inventory and reduce stockouts. The company analyzes real-time sales data, weather patterns, and seasonal trends to ensure stores are stocked with the right products. Walmart's AI-driven supply chain improvements have reduced overstock and improved product availability [6].

In India, AI-driven demand forecasting helps farmers plan crop production and distribution. Companies like [6]*CropIn* use AI to analyze satellite data, weather conditions, and market demand, allowing farmers to grow the right crops at the right time. This reduces food waste, improves market prices, and enhances supply chain efficiency [23].

Recognizing the limitations of traditional methods, Amazon turned to AI as the solution to its supply chain challenges. By leveraging machine learning, predictive analytics, and automation, Amazon has transformed its supply chain into a highly responsive and efficient system. The company has revolutionized demand forecasting by using AI to analyze real-time data from sales, social media, economic trends, and weather patterns. Unlike traditional methods, AI-driven forecasting improves accuracy by predicting demand shifts and adjusting inventory accordingly. This approach reduces stockouts and excess inventory, enhancing efficiency and cost-effectiveness [25].

Further, a key application is regional demand forecasting. For example, if a storm is expected, Amazon's AI system increases the stock of essential items in nearby warehouses. This proactive inventory management ensures product availability and improves customer satisfaction while minimizing losses [11].

Additionally, the Shell company has also implemented AI-based demand forecasting for fuel distribution in multiple countries, including the Netherlands, Singapore, and the UK. By using machine learning algorithms, Shell predicts fuel demand based on traffic patterns, economic activity, and weather

[5] EPA - An independent agency with responsibility to promote, facilitate and coordinate effective environmental management, protection, and sustenance of Guyana of Natural Resources.

[6] Founded in 2010, CropIn is a global Agtech pioneer who has built the world's first purpose-built industry cloud for Agriculture.

conditions. This reduces shortages, optimizes fuel storage, and improves logistics planning [26].

These examples show how AI-based demand forecasting can improve supply chain efficiency in supermarkets, agriculture, and fuel distribution. Guyana can benefit by using AI to streamline inventory, align agricultural production with demand, and improve fuel distribution. As the country develops its oil and gas sector, AI can also help predict energy needs and optimize exports. Embracing AI-driven forecasting will create a more resilient, efficient, and competitive economy. Using AI to predict demand for rice, sugar, and fuel ensures inventory is positioned where needed, reducing waste.

SME Empowerment *(Digital consultants ("AskGov") and AI credit scoring*

To bolster business competitiveness for SMEs, the government of Guyana launched "AskGov," a Generative AI platform trained on local regulatory frameworks. This tool allows local entrepreneurs to navigate the complexities of the Local Content Act and tax filings through a natural language interface, effectively acting as a 24/7 digital consultant for small businesses in remote regions [34]. Furthermore, local financial institutions like Republic Bank (Guyana) have implemented AI-driven credit scoring models that analyze non-traditional data (such as utility payments), enabling SMEs without extensive credit histories to access the capital needed for trade expansion [35].

Avakov [2] posits that Small Midsize Enterprises (SMEs) can leverage AI-driven market analysis tools to identify trends, adjust pricing strategies, and improve customer engagement. AI-powered chatbots and Customer Relationship Management (CRM) systems help businesses compete with international firms.

Avakov [2], argued that the integration of AI allows SMEs to personalize their customer interactions and deliver more tailored solutions, leading to increased customer satisfaction and loyalty. AI-powered tools, such as machine learning, predictive analytics, and natural language processing, enable businesses to identify trends, predict customer behaviours, and optimize resources. By automating data collection and analysis, these tools reduce the reliance on manual processes and minimize human error. SMEs, which often have limited resources, can benefit significantly from such technologies, as they provide access to advanced analytics previously only available to larger corporations.

An example of Avakov method of AI integration can be seen at Hootsuite (a social media management platform in Canada). Hootsuite uses AI to analyze market trends and social media sentiment, providing SMEs with insights on how to tailor their marketing campaigns and engage effectively with customers. The platform also offers AI-powered tools for scheduling posts and analyzing performance metrics, allowing small businesses to optimize their social media presence [8].

Additionally, Loom is a video messaging platform in the USA that uses AI to enhance customer engagement by providing automated responses and personalized suggestions through its AI-powered chatbot. This chatbot helps users find solutions to common queries and streamlines customer support, making it easier for SMEs to interact with customers efficiently [17].

OmniLens is another example of an AI-powered analytics tool for SMEs in the retail sector, OmniLens helps businesses analyze sales patterns, customer preferences, and competitor behavior. By providing insights into market trends and adjusting inventory and pricing strategies, it enables retailers to make data-driven decisions that improve profitability and stay competitive [22].

In Guyana, SMEs can implement AI-driven tools, like the expansion of the AskGov tool to enhance market analysis, pricing strategies, and

customer engagement, similar to the examples from Hootsuite, Loom, and OmniLens. Local retail businesses could adopt AI tools for social media sentiment analysis and sales forecasting, enabling them to better understand market trends and customer behaviour, just like Hootsuite's AI-driven market analysis. Small hotels and restaurants could use AI-powered chatbots and CRM systems (similar to Loom's platform) to engage customers and provide 24/7 support, enhancing the overall customer experience.

Additionally, AskGov has the potential to have local retailers integrate AI-powered analytics tools like OmniLens to monitor sales data, adjust pricing strategies, and optimize inventory based on consumer preferences and competitor activities. By adopting these AI tools, SMEs in Guyana can enhance their operational efficiency, improve customer satisfaction, and better compete with international firms [27].

Guyanese agro-processors, such as Roy's Quality Spices and Sterling Products Limited, can leverage AI-driven market analysis to monitor demand trends for exports like rice, sugar, and spices, use AI-powered CRM tools to maintain relationships with international buyers and improve sales forecasting, and optimize pricing based on global demand and real-time market conditions, ensuring competitiveness in Caribbean and North American markets [9].

AI-driven market analysis and trend identification play a crucial role in helping businesses analyze large datasets to uncover patterns beyond human capabilities. By leveraging AI algorithms, companies can forecast market demand, optimize inventory, and streamline operations based on real-time data. This technology enhances decision-making, reduces risks, and ensures that businesses remain competitive in fast-changing industries [9]. This suggests that AI-powered analytics can be particularly beneficial for SMEs in emerging economies like Guyana, where data-driven insights can support local businesses in adapting to consumer preferences and market shifts.

Additionally, AI-driven pricing strategies and customer engagement solutions enable businesses to compete effectively with international firms. AI-powered dynamic pricing models are revolutionizing industries such as food & beverage and hospitality by adjusting prices in real-time based on demand, competitor pricing, and external factors [7]. Similarly, Generative AI enhances marketing and customer engagement by creating personalized content, automating responses, and improving customer interactions [16]. These advancements allow businesses to optimize revenue generation while delivering tailored experiences to customers, fostering long-term loyalty and brand growth.

Regulatory Compliance and Policy Adherence

The AskGov AI-powered digital platform, by extension, provides 24/7 access to Guyana’s regulatory frameworks, such as the Local Content Act and tax laws. By allowing users to navigate complex administrative tasks through natural language on mobile devices, it eliminates the need for hinterland residents to travel to Georgetown for basic inquiries. This automation streamlines government operations, reducing manual workloads and allowing agencies to prioritize high-level compliance and oversight.

To reinforce the AskGov initiative, we look at LeewayHertz [18], who argued that Artificial Intelligence (AI) can automate compliance monitoring, while automated auditing tools also ensure transparency in contract allocation and resource management. This suggests that AI will have the capability to reduce the risk of non-compliance with local content policies.

For example, the U.S. Securities and Exchange Commission (SEC), used AI to automate compliance monitoring in the financial sector. SEC uses machine learning

algorithms to analyze massive datasets and detect suspicious trading activities or potential violations of financial regulations. The SEC's AI-driven system helps identify insider trading, market manipulation, and other compliance breaches more efficiently than manual methods. The system analyzes transaction data, market trends, and social media sentiment, providing regulators with insights into potential risks and ensuring that firms adhere to legal standards. This approach helps reduce human error and allows for faster identification of non-compliance [4].

In Guyana, AI can improve compliance monitoring in industries like oil and gas by ensuring adherence to local content policies. For instance, the application of automated auditing tools to oversee contract allocation and resource management [12]. This suggests that AI can help identify discrepancies in the allocation of contracts to local companies, ensuring compliance with regulations that prioritize local businesses. Notably, the Local Content Act in Guyana mandates that a certain percentage of contracts and employment be allocated to local suppliers and workers in the oil and gas industry. AI-powered systems can automatically cross-check contract allocations and track performance against local content requirements, reducing the risk of non-compliance [5].

Additionally, AI-driven solutions can be used by government agencies or regulatory bodies in Guyana to conduct automated audits, ensuring that resource management practices meet regulatory standards. In sectors such as mining and construction, where transparency is crucial, AI can flag potential compliance violations or inefficiencies, allowing for proactive interventions. For instance, an AI system might analyze project data to verify that local contractors are given priority and that resources like materials and labor are being sourced according to the legal framework. These tools would streamline the audit process, minimize human error, and enhance transparency in the management of natural resources and government contracts.

According to Jones [12], in the United Kingdom, the National Audit Office (NAO) has employed AI-based auditing tools to improve transparency and efficiency in the public sector. The NAO uses data analytics and machine learning algorithms to examine large volumes of government spending data, ensuring that funds are allocated according to legal requirements and policy guidelines. Jones argued that by automating the auditing process, the NAO can detect discrepancies, errors, or mismanagement in real-time, improving accountability and resource management. Additionally, AI tools also help identify trends and patterns that might indicate potential compliance failures, reducing the likelihood of fraud or inefficient use of public resources.

Based on these examples, AI-driven compliance monitoring can enhance transparency in sectors like oil and gas, agriculture, and public procurement in Guyana. For example, AI tools could automate the verification of local content compliance in the oil and gas industry by analyzing contract allocations, employment data, and resource distribution to ensure that a required percentage is awarded to local businesses, as mandated by the Local Content Act. This technology could reduce administrative errors and improve efficiency, ensuring that regulatory guidelines are met in real-time. Similarly, AI can be applied in public procurement to track contracting processes and identify potential discrepancies or corruption, enhancing accountability in government spending and resource management [28].

Additionally, AI-based auditing systems could streamline the management of public resources in Guyana. Agencies such as the Guyana Revenue Authority could use AI to detect tax evasion by cross-referencing business transaction data with tax filings, flagging discrepancies for further investigation. AI can also assist in the monitoring of natural

resource management, ensuring sustainable practices, and verifying compliance with environmental regulations in the mining and forestry sectors. By automating these processes, Guyana can foster better governance, transparency, and efficiency in managing its natural resources and public funds.

Environmental Stewardship (Predictive Maintenance and Real-time Monitoring)

As Guyana is applying Digital Twin technology to civil infrastructure. As part of the Silica City initiative, the government is developing a 3D AI-driven model of the national power grid and drainage systems [32]. This system uses real-time sensors to predict "koker" (sluice) failures and urban flooding risks, allowing the Ministry of Public Works to conduct proactive maintenance before seasonal rains begin, thereby protecting commercial logistics routes [32].

A review of environmental monitoring and sustainability was conducted by Kumar et al. [15], which revealed that Artificial Intelligence (AI)-driven environmental monitoring tools are increasingly being utilized to predict and mitigate ecological risks, thereby supporting eco-friendly business practices. These AI-powered solutions leverage machine learning algorithms, big data analytics, and remote sensing technologies to detect environmental changes, such as air and water pollution, deforestation, and climate anomalies, in real-time. This suggests that by enabling early detection and intervention, AI enhances the effectiveness of conservation efforts and regulatory compliance, reducing negative environmental impacts.

Jia et al. [13] conducted a comprehensive review on Cleaner Production, which shows that predictive maintenance in industrial operations powered by AI, significantly reduces waste and enhances resource efficiency. Jia et al. argued that by analyzing equipment performance data, AI can forecast potential failures and optimize maintenance schedules, thereby minimizing downtime, extending asset lifespan, and reducing resource consumption This not only improves operational efficiency but also reduces carbon footprints and industrial waste generation.

The application of AI in environmental monitoring and predictive maintenance directly contributes to the achievement of multiple Sustainable Development Goals (SDGs). For instance, AI-driven environmental monitoring supports SDG 13 (Climate Action) by improving climate resilience and response strategies. It also aids SDG 14 (Life Below Water) and SDG 15 (Life on Land) by preventing pollution and habitat destruction. Meanwhile, predictive maintenance aligns with SDG 9 (Industry, Innovation, and Infrastructure) by promoting sustainable industrialization and SDG 12 (Responsible Consumption and Production) by optimizing resource use and minimizing waste [23] and [13].

Guyana can leverage AI-driven environmental monitoring to protect its rich biodiversity and natural resources. AI-powered satellite imaging and remote sensing can track deforestation, illegal mining, and water pollution in key areas like the Amazon rainforest and the Essequibo River [15]. Real-time data can support conservation efforts and regulatory actions, aligning with the country's Low Carbon Development Strategy (LCDS) and SDG 13 (Climate Action). Additionally, AI-based air quality monitoring can help address pollution from urban and industrial growth, improving environmental sustainability and public health (SDG 15 - Life on Land) [13].

Additionally, in Guyana's oil and gas sector, AI-driven predictive maintenance can minimize equipment failures, reduce emissions, and enhance safety in offshore operations (SDG 12 - Responsible Consumption and Production) [13]. AI can also optimize agriculture by improving irrigation and fertilizer use, ensuring sustainable food production (SDG 9 - Industry,

Innovation, and Infrastructure) [15]. By integrating AI into these sectors, Guyana can balance economic growth with environmental protection, reinforcing its leadership in green technology adoption.

The review conducted by Jia et al. [13] and others [15] [23] examined the link between Sustainable Development Goals (SDGs) and environmental monitoring and predictive maintenance; this comprehensive review concludes that integrating AI technologies into environmental and industrial management, businesses and governments can transition towards more sustainable practices, fostering a balance between economic growth and environmental stewardship. The following are examples of how AI integration impacts Sustainable Development Goals (SDGs).

A review conducted by Numalis [20], demonstrate the scope of AI in the Oil and Gas industries. The findings shows the many areas where AI continues to improve efficiency in the oil and gas industry, such as equipment maintenance and reservoir modeling. For instance, AI-powered systems using machine learning and deep learning can help in upstream operators find optimal wells. Studies indicate that AI can help improve the recovery of hydrocarbons by 10%, corresponding to accessing about $1 trillion worth of oil.

In Germany, [7]Siemens [24] uses AI-driven predictive maintenance to enhance energy efficiency and reduce waste, supporting SDG 9 (Industry, Innovation, and Infrastructure) and SDG 12 (Responsible Consumption and Production). By predicting equipment failures, Siemens prevents breakdowns, minimizes resource wastage, and lowers carbon emissions, aligning with SDG 13 [24].

Additionally, IBM and Tesla also leverage AI for sustainable practices. IBM's AI monitors air and water quality, helping industries reduce pollution and comply with regulations, contributing to SDG 6 (Clean Water and Sanitation) and SDG 14 (Life Below Water) [10]. Tesla optimizes resource use and predictive maintenance in its production processes, reducing waste and enhancing efficiency, aligning with SDG 12 and SDG 9 [29]. These AI applications ensure sustainability while improving industrial performance.

Further, given Guyana's burgeoning oil and gas sector, AI can be used for predictive maintenance in drilling operations and equipment management. By implementing AI tools to predict equipment failures and optimize energy usage, oil companies can minimize downtime and reduce waste, leading to more sustainable resource extraction. Additionally, AI-driven environmental monitoring tools could be used to monitor oil spills, air quality, and water contamination, helping to mitigate ecological risks and ensure compliance with environmental regulations.

Notably, ExxonMobil is one of the largest players in Guyana's oil and gas sector, and while the company is not explicitly using AI for environmental monitoring or predictive maintenance in public disclosures, it is known to leverage advanced technologies to optimize operations and reduce environmental impact. The company uses digital monitoring tools to assess offshore drilling operations, detect equipment malfunctions, and prevent spills. AI could be integrated into these systems to enhance predictive maintenance and further mitigate ecological risks, aligning with ExxonMobil's focus on sustainability [19].

Additionally, the Environmental Protection Agency (EPA) of Guyana has partnered with Maxar Technologies to employ AI-powered environmental monitoring tools. This collaboration enables the EPA to monitor offshore petroleum activities in real-time, utilizing services like the Crow's Nest Multi-Sensor Oil Detection to identify potential spills and ensure compliance with environmental

[7] Siemens is a German multinational technology conglomerate that focuses on various sectors, including industrial automation, infrastructure, transport, and healthcare.

regulations [19]. These initiatives demonstrate Guyana's commitment to integrating advanced AI technologies in its oil and gas industry to promote sustainable resource extraction and environmental stewardship.

Similarly, in the Agriculture sector, AI can help monitor environmental variables such as soil moisture, temperature, and weather patterns to predict crop health and optimize resource usage. Predictive maintenance systems can also be used on irrigation equipment and machinery, reducing waste, improving water usage efficiency, and ensuring that farming equipment operates at optimal levels. AI tools can aid in minimizing pesticide usage, optimizing fertilizer application, and managing irrigation schedules to reduce environmental impact. In the local agricultural sector, AI has moved beyond theory into field application.

Notably, the Guyana Rice Development Board (GRDB) now utilizes AI-equipped drones to conduct multispectral imaging of rice paddies [30]. By analyzing "heat maps" of crop health, farmers can implement variable-rate fertilization, reducing chemical waste by an estimated 15% while maximizing yields in regions like Mahaica-Berbice [30]. Similarly, GuySuCo has integrated AI-driven predictive modeling at the Albion Estate to automate the scheduling of mechanical harvesters based on real-time weather patterns and cane maturity data, addressing chronic labor shortages [31].

Likewise, SMEs in Guyana's manufacturing and industrial sectors can leverage predictive maintenance to reduce equipment downtime and waste. By employing AI to monitor machine performance and anticipate failures before they occur, companies can minimize the need for emergency repairs, which often result in wasted resources and higher energy consumption. AI-driven resource efficiency monitoring can also help businesses track material usage, optimize energy consumption, and reduce carbon emissions, supporting eco-friendly operations. Companies such as Demerara Distillers Limited (DDL), which is one of the country's largest manufacturers, may use data analytics and predictive technologies to maintain equipment and reduce downtime.

While these companies are on the path to technological innovation, AI-driven environmental monitoring and predictive maintenance are still emerging fields in Guyana. There are significant expansion opportunities, particularly with the continued growth in the oil and gas sector, agriculture, and manufacturing industries. Local companies, along with government support and potential collaborations with international tech firms, could explore AI-based tools to improve resource management, reduce waste, and enhance sustainability.

Summary of Findings

SME Empowerment

The government's AskGov platform serves as a 24/7 digital consultant, enabling local entrepreneurs to navigate the complex Local Content Act and tax filings through natural language. This is complemented by local financial institutions like Republic Bank, which use AI credit scoring to analyze non-traditional data, such as utility payments, to unlock capital for businesses lacking formal credit histories. These tools collectively lower the barriers to entry, allowing small businesses to compete effectively with international firms.

Predictive Logistics

AI-driven demand forecasting is revolutionizing supply chain efficiency across Guyana's retail, agriculture, and fuel sectors. By analyzing historical sales, weather patterns, and consumer behavior, these systems prevent both stockouts and overstock waste. In the agricultural sector specifically, the GRDB and GuySuCo utilize AI-equipped drones and multispectral imaging to optimize fertilization and harvesting, which has already demonstrated a 15% reduction in chemical waste in regions like Mahaica-Berbice.

Regulatory Oversight

To ensure transparency in the booming oil and gas industry, the EPA has deployed AI-powered measuring instruments on FPSO vessels to track production and waste disposal in real-time. These automated auditing tools allow authorities to monitor every barrel produced, ensuring strict adherence to environmental regulations and the Local Content Act. This shifts oversight from manual, error-prone processes to a continuous, cloud-based verification system that guarantees fair contract allocations for Guyanese workers.

Environmental Stewardship

Guyana is leveraging AI to protect its natural resources through predictive maintenance and real-time ecological monitoring. As part of the Silica City initiative, 3D AI models of the national power grid and drainage systems use sensors to predict "koker" (sluice) failures and urban flooding risks. Furthermore, technologies like Digital Twins on vessels such as the Liza Unity allow for proactive equipment maintenance, minimizing the risk of oil spills and reducing the overall carbon footprint of industrial operations.

Conclusion

Guyana is rapidly transitioning from a traditional resource-based economy to a digitally-augmented one. The synergy between government-led AI initiatives, like AskGov, and private-sector technological investments, such as Digital Twin modeling, has created a robust framework for sustainable development. By automating regulatory compliance and optimizing supply chains in the agriculture and energy sectors, the country is effectively positioning itself as a regional leader in green technology and industrial innovation.

The findings revealed that AI-driven integration in Guyana enhances trade efficiency through a multi-sectoral approach: the AskGov platform and non-traditional credit scoring at Republic Bank democratize access to regulatory guidance and capital for SMEs , while industrial precision tools like Digital Twins on the Liza Unity and GRDB drones stabilize supply chains and reduce agricultural chemical waste by 15%. Furthermore, real-time monitoring by the EPA ensures regulatory transparency and compliance with the Local Content Act , and the Silica City project’s 3D AI models strengthen climate resilience by predicting infrastructure failures to protect vital commercial logistics routes.

However, the full realization of this potential faces critical hurdles. The current digital divide and a lack of long-term longitudinal data on pilot projects like Silica City mean that the benefits of AI are currently most visible in urban and industrial hubs rather than the deep hinterland. Addressing these limitations is essential to ensure that the "Digital Guyana" initiative results in equitable growth across all demographics.

To bridge these gaps, it is recommended that the government prioritize offline synchronization and multi-language support for its digital platforms. By establishing a National AI Data Warehouse, Guyana can democratize access to high-value data, empowering local SMEs to build homegrown solutions. This strategic evolution will ensure that the nation’s digital infrastructure is as resilient and inclusive as the physical resources that currently drive its economy.

Limitations

Temporal Constraints and Pilot Data

A primary limitation of this research is the lack of long-term longitudinal data, as many of the featured AI deployments, including AskGov and the Silica City 3D modeling are currently in their early or pilot stages. Because these systems have only recently been integrated into Guyana's national infrastructure, it is difficult to measure their long-term socio-economic impact or their durability against shifting market cycles. Consequently, the findings represent a "snapshot" of potential

rather than a comprehensive analysis of sustained performance over several years.

Infrastructure and the Digital Divide

Furthermore, the "digital divide" remains a significant barrier to the universal efficacy of AI tools in Guyana, particularly concerning high-speed internet penetration in deep riverine and interior regions. While the government aims for remote accessibility via mobile devices, citizens in the hinterland may still face connectivity hurdles that prevent them from fully utilizing real-time platforms like AskGov. This geographical disparity suggests that the immediate benefits of AI integration may be more concentrated in urban coastal centers, potentially leaving rural agricultural and mining communities at a temporary disadvantage.

Recommendations

Strategic Expansion of Digital Governance

To maximize the inclusivity of the "Digital Guyana" initiative, it is recommended that the government expand the AskGov architecture to incorporate multi-language support and offline capabilities. Integrating Indigenous languages and Dutch or Portuguese translations would ensure that hinterland communities and border regions are not left behind by the digital transition. Furthermore, developing a lightweight, offline-synchronized version of the app would allow entrepreneurs in areas with intermittent connectivity to access critical regulatory and tax guidance without requiring a constant high-speed internet connection.

Data Democratization and Local Innovation

Additionally, establishing a centralized National AI Data Warehouse would serve as a powerful catalyst for local innovation. By providing SMEs with access to anonymized, high-quality datasets—including historical market trends, multispectral soil data, and real-time weather patterns—the government can significantly lower the R&D costs for local tech startups. This "data democratization" would enable small-scale agro-processors and retailers to build their own predictive models, fostering a homegrown tech ecosystem that reduces reliance on expensive international software and aligns with national development goals.

Conflict of Interest

The authors declare no conflicts of interest in conducting this research. The study is conducted with an objective approach to analyzing the potential of AI in Guyana’s trade and commerce sectors.

Ethical Approval

This study was conducted in accordance with the ethical standards of Texila American University. As the research primarily utilized a synthesis of secondary literature, publicly available government policy documents (such as the Local Content Act and LCDS), and anonymized professional interviews, it was deemed exempt from full Institutional Review Board (IRB) review. All virtual interviews were conducted with informed consent, ensuring participant confidentiality and the voluntary nature of data contribution. No sensitive personal data or classified government records were accessed during this study.

Author Contributions

Dr. Visham F. Budhoo is the sole author of this research. He was responsible for the conceptualization of the study, the design of the research methodology, data collection and synthesis, the comparative analysis of AI adoption in emerging markets, and the drafting and critical revision of the manuscript. The author has read and approved the final version of the article for publication.

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Data Availability

The data supporting the findings of this study are derived from a combination of public domain documents and synthesized industry reports. Primary data, including comparative benchmarking datasets for Guyana, are available from the corresponding author, Dr. Visham F. Budhoo, upon reasonable request. Publicly cited data regarding the Liza Unity and AskGov initiative can be accessed via the Ministry of Natural Resources and official Government of Guyana digital portals.

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