



Artificial intelligence for economic transformation: Innovation, leadership, and workforce optimization

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Abstract

Today, a significant switch from traditional systems to digital systems is evident in many countries, and this study, discusses the readiness of Papua New Guinea (PNG), as in November 2025, its Prime Minister, Honourable James Marape, officially opened digital transformation for the growth and development of the country. PNG has strong cultural diversity and falls under the developing countries. Artificial Intelligence (AI) has the capacity to reshape any developing country's economic development, but at the graduate level, universities do not provide Papua New Guineans with industry-relevant skills to equip and grasp industry-relevant opportunities. Modernizing sectors with digital tools can significantly support development, like adoption of AI, digital transformation, workforce development, and entrepreneurship skills, which can accelerate economic development. But, because of 840 living indigenous languages in the country, it is harder to introduce new AI technologies and digital technologies to uplift Papua New Guineans. AI surely can provide huge opportunities to Papua New Guineans, this study explored the adoption of AI in entrepreneurship, tourism, leadership, workforce optimization and business innovation, and checked if it can truly shape the future of global markets. Entrepreneurship and leadership qualities must be introduced in universities, where students are fostered with actionable academic and valuable skills. Various research has concluded PNG to have coordinated efforts for it to stay competitive in the tourism sector. The study emphasizes the significance of implementing strategic planning and effective policies to foster economic growth and digital transformation. The findings show limited skilled workforce, infrastructure, and internet connectivity in PNG, increasing barriers for AI adoption. The result prioritized improving the prerequisites to adopt AI, over technological sophistication, and suggests adopting locally appropriate AI governance frameworks to increase economic growth.

Keywords: Artificial intelligence; digital transformation; economic growth; problem-solving; innovation

1. Introduction

1.1 Background: AI and global economic transformation

The traditional systems are getting digitized in many countries, and a study discussing the readiness of Papua New Guinea (PNG) is presented.

AI technologies are adopted in advanced economies and in developing nations. Leveraging Artificial Intelligence (AI) boosts economic growth, addresses critical challenges, and improves the population's quality of life. Papua New Guinea comes under developing countries, and in developing countries, AI has the potential to improve transformation and innovation across various sectors. Based on the January 2026 release of Microsoft's AI Diffusion Report 2025, the Global AI adoption has reached 16.3% by H2 2025, with Global North (i.e., working-age population between 15 to 64 years, who actively used generative AI tools during H2 2025, from July to December) at 24.7%, where Global South (i.e., developing/lower-middle-income economy, whose AI diffusion among working-age populations reached) at 14.1%. AI drives economic growth through precision agriculture, workforce automation, and healthcare diagnostics, leaving the traditional development stages behind.

1.2 Papua New Guinea's development context

PNG belongs to the Global South (developing/lower-middle-income economy), which faces compounded barriers and needs targeted strategies. To strengthen the growth and development of Papua New Guinea, National Digital Transformation Summit was launched under James Marape's leadership, in November 2025, targeting to increase its Gross Domestic Product (GDP) growth to 4%+ despite of 24.1% internet penetration, 87% rural population, 840 languages, and university skills gaps (Papua New Guinea | World Bank Group, 2026; Papua New Guinea, 2025).

In addition, PNG is a Low-Resource Language Country (LRLC), which faces ~20% lower AI adoption when compared to baseline because of poor Large Language Model (LLM) performance on scarce-data languages (Papua New Guinea, 2025).

Considering its record of 4% GDP growth in four consecutive years, mainly regardless of economic disruptions caused by COVID-19, PNG is still expecting to see similar growth in the coming years with modernization and structural reforms in sectors using digital technologies. With rapid transformation in organizations due to the adoption of digital technologies, AI has gained power to shape productivity, innovation, and competitiveness in the global economy. With AI, organizations are empowered with automation of processes, analyzation of complex data, improvisation of decision-making, and creation of new value across industries. Thus, worldwide governments consider AI as a strategic asset driving economic growth, efficiency in public sector, and global market integration.

1.3 Objective

To explore AI adoption in PNG's priority economic sectors (i.e., entrepreneurship, tourism, leadership, and workforce systems).

1.4 Research questions

The following research questions will be the focus of this study:

- 1) How is AI transforming PNG's priority economic sector?
- 2) What role does AI play in PNG's business innovation and global market competitiveness?
- 3) What challenges and opportunities exist for PNG's AI adoption?

1.5 Scope of study

Focuses on examining AI applications in PNG's priority sectors—entrepreneurship, tourism and hospitality, leadership/decision-making, workforce optimization, and business innovation, using 2025-2026 secondary data i.e., Microsoft AI Diffusion and PNG government reports. The scope excludes primary data collection, technical AI implementation details, and non-priority sectors like health and agriculture. PNG-specific challenges will be the main focus (i.e., 840 languages, 24.1% internet penetration, skills gaps).

1.6 Rationale and significance of the study

Based on PNG's AI Diffusion Data Source, PNG showed 7.20% in H1 2025, AI diffusion was 7.3% by H2 2025, and it just grew by 0.2%, which is way lower than the global increase of 1.2% to 16.3%, reflecting low connectivity and linguistic diversity, despite of PM Marape's 2025 Digital Summit (Kia, 2025).

This reflects critical barriers such as, 24.1% internet penetration, 840 languages language diversity (LRLC status), and university skills gaps among 87% rural population.

This study addresses these gaps by mapping AI applications across priority sectors of PNG (i.e., entrepreneurship, tourism, leadership, workforce optimization and business innovation), to provide actionable strategies for SMEs (Small, Medium Enterprises), universities, and policymakers to accelerate AI adoption, unlock economic opportunities for Papua New Guineans, and enhance global market competitiveness, amid LRLC linguistic barriers.

2. Literature review

2.1 Current AI Adoption trends and baselines

Based on the Microsoft AI Diffusion Report, PNG is qualified as Low-Resource Language Countries (LRLC) due to 840 living indigenous languages, 7.3% diffusion it faces ~20% lower AI

adoption when compared to baseline, because of poor LLM performance on scarce-data languages.

The reason for LRLCs to suffer is being multilingual, with less training data for the LLMs to perform poorly (~20% adoption penalty after GDP/internet controls). In PNG's context, there are 840 languages, where English and Tok Pisin language get decent coverage; 830 indigenous languages are ignored by most of the LLMs (Papua New Guinea, 2025).

In contrast to Global South (14.1% H2) or LRLCs (language barriers slow diffusion by ~20%), Microsoft-AI-Diffusion-Report shows PNG has 7.3% diffusion in contrast to Global North's 24.7% (working-age population between 15 to 64 years, who actively used generative AI tools during H2 2025). Despite of Digital Transformation Summit and the 2026 AI governance shift, slow growth highlights critical workforce and university skills gaps, where low diffusion is directly associated with PNG graduates, who lack industry-based AI competencies, which limit practical adoption of only 24.1% internet penetration for 87% rural population. These factors are the challenges for the spread of digital adoption and slowdowns the integration of AI-driven solutions into mainstream economic activities (Corporate Responsibility, 2026).

Table 1 exhibits diffusion and key factors for Global North and Global South, which highlights the difference in developed economies and developing economies' infrastructure and education systems. PNG has risk of eliminating the benefits of AI without multilingual models and targeted training, which increases the inequality despite policy momentum like the National AI Framework (Corporate Responsibility, 2026).

Table 1: H2 2025 AI Diffusion and key factors for Global North and Global South

Region/Economy	H2 2025 AI Diffusion	Key factors
Global North (Developed Economies)	24.7%	High skills, infrastructure
Global South (Developing Economies)	14.1%	Moderate gaps
PNG (LRLC within Global South)	7.3%	Skills gaps, connectivity, languages
Global Average	16.3%	

Source: (Corporate Responsibility, 2026)

2.2 AI in different sectors

According to (Bajwa et al., 2021; Mahajan et al., 2019), Artificial Intelligence's outstanding differences in the healthcare sector showed revolution in multiple ways, for instance, early detection of diseases (for example, cardiovascular conditions, cancer, tuberculosis), to provide treatment to the patients at the right time and improve their outcomes. Other transformations in the healthcare sector inclIMFude optimized treatment plans, outbreak prediction of disease by using

AI models, to analyse data from different sources like health records, social media, and environmental sensors, to help take proactive measures to stop the spread of diseases, and save the lives of people (Stankovich & United Nations Development Programme, 2022). AI has boosted agricultural productivity and sustainability via applications like crop monitoring, precision farming, pest detection, and so on in developing countries (Doris, 2025). In addition, AI has supported and transformed education sector and various other sectors with its effective innovations. Likewise, AI has the scope of driving economic growth by adopting innovation, paving the way to create jobs and attract investments. Additionally, AI improves productivity, automates routine tasks to enhance productivity and evades the traditional development stages in developing countries. In summary, AI supports the improvement of operational efficiency and decision-making across industries (Scoble, 2025).

2.3 Theoretical frameworks and global perspectives on AI

According to (Filippucci et al., 2024; OECD, 2021), supporting case studies in specific sectors have confirmed preliminary evidence showing AI's transformative potential on production processes. For example, AI integration is adopted in service sectors, where a fourth of hedge-fund managers have reported 80% of decision making depending on AI. Over the past five years, investment in AI-related ventures has tripled. Based on the research, even the slowly digitizing sectors like the transport sector and public sector, suggested that increased efficiency can be achieved by AI integration. Evidence show high exposure to generative AI technologies can experience stronger market valuations compared to non-AI-exposed occupations. These findings highlight the benefits of sector-wide productivity and firm-level financial advantages associated with AI integration.

As per (Weiyu et al., 2025), the impact of Artificial Intelligence Implementation on Employee Performance and Employee Engagement was investigated, including the moderating role of Organizational Agility in Chinese manufacturing sector's Information Technology (IT) integration. The results showed Organizational Agility positively regulates the relationship between AI adoption and Employee Engagement. Thus, such organizations are observed as highly effective in turning AI-driven IT initiatives into higher employee engagement.

2.4 Regional and developing economy context

According to the AI Asia Pacific Institute 2024 study, many Pacific Island nations, including Papua New Guinea lacks comprehensive national AI strategies, especially when the countries are following digital government plans. AI governance frameworks are reported as underdeveloped. The report highlights the importance to collaborate regionally for sharing knowledge, resources, and expertise, in order to strengthen local skills, institutional capabilities, and workforce readiness (AI Asia Pacific Institute et al., 2024).

According to (M et al., 2025), AI adoption is suggested as transforming the global business operations, but it is not yet adopted in developing countries' Micro, Small and Medium Enterprises

(MSMEs). It is verified that MSMEs face various constraints, including lack of awareness, resistance to change, limited digital infrastructure, which increases the challenging of effectively integrating AI technologies. The findings of this research show that AI benefits' awareness is increasing, yet practical AI adoption is low because of inadequate infrastructure, cost issues, and limited technical expertise. AI adoption in MSMEs boosts decision-making, helps to improve customer experience, and streamlines the processes of supply chain. Usually, MSMEs, in developing countries faces challenges in maximizing productivity, but with AI integration, organizational operations can be optimized, increasing productivity, efficiency, competitiveness, and cost saving. The researchers conclude that in MSMEs, AI adoption needs a multi-dimensional strategy, with targeted policy interventions, awareness campaigns, and capacity-building efforts. Further, accelerating AI integration in MSMEs will need leadership commitment, organizational culture, and access of affordable digital tools.

2.5 Governance, ethics and PNG context

According to (Sun et al., 2024), PNG has progressed in ICT, computing, national ICT policies, and digital technologies in 2018, and the universities provide this education.

AI adoption can result in increasing bias, public mistrust and privacy violations. The IMF and UN discussions, including multidisciplinary academic work, argue building regulatory foundations early, even in countries where AI use is still modest, to avoid lock-in of harmful practices and to attract responsible investment. These governance recommendations are particularly relevant for PNG, as it expands digital government and public service digitization (Shalal, 2025).

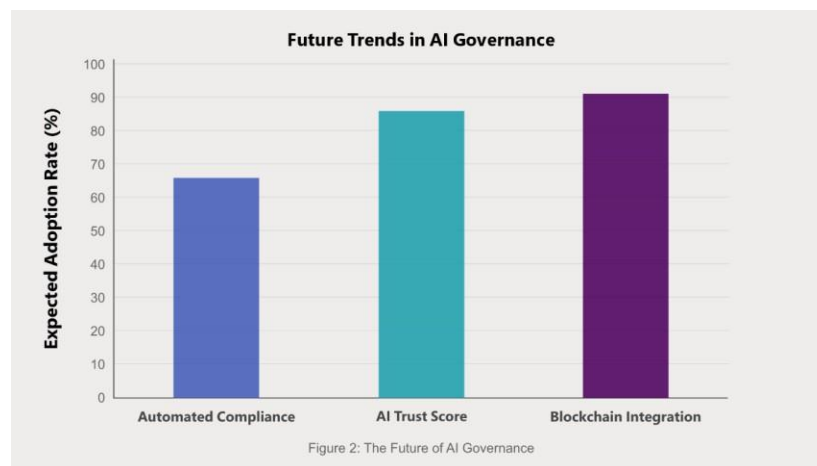


Figure 1: Future of AI Governance Source: (Singh, 2025)

The increasing significance of accountability, automation, and security in AI governance demonstrates how these elements help shape the future of the field.

As per (Rana et al., 2024), AI adoption in universities and higher education is synthesized to understand the underlying factors that shape the behavioural intentions of users for academic

purposes in a developing country. This research highlights that trust and privacy are considered as significant to users' behavioural intention. The accepted variables to predict users' behavioural intention to align with AI adoption for academic purposes in developing countries are social influence, performance expectancy, effort expectancy, privacy, and trust. This study helps SMEs/businesses using AI, educational institutions teaching AI skills, and policy makers, facilitating smooth adoption of AI technologies in developing countries while emphasizing the significance of privacy, trust, and ongoing refinement.

According to (Aderibigbe et al., 2023), considering the developing countries' context, comparative case studies provide operational lessons such as, successful initiatives are localized pilot projects that demonstrates value, public-private partnerships leverage technical expertise and funding, and customized capacity-building programs help meet the local needs. The research suggests that limited and unsustainable results are the outcome of small, uncoordinated, or isolated investments without integrated policy frameworks. Countries like PNG need a coordinated national roadmap, which links infrastructure, governance, education, and MSME support.

2.6 Synthesis and research gaps

According to (AI Asia Pacific Institute et al., 2024), the OECD synthesized AI as general-purpose technology. It is observed that PNG lacks comprehensive AI strategies though digital government plans are opened (AI Asia Pacific 2024). PNG-specific sectoral gaps are identified. The literature review identifies research gaps regarding Papua New Guinea (PNG) by examining sectoral diagnostics, policy documents, workforce readiness. The global and regional level analyses provide a strong foundation of the concept, but lack of empirical work in PNG is observed, which limits providing necessary recommendation. To ensure AI-enabled economic transformation, it is necessary to fill this gap and help the educators, policymakers, and industry stakeholders move from high-level ambition to implementable strategies. This study addresses the above identified sectoral gaps in PNG.

2.7 AI readiness

For any country to grow, government has a crucial role to play, to facilitate suitable environment for the companies and sectors in regional and urban areas. Special attention is required in regional and underserved regions.

According to (Hamdar et al., 2023), for digital development, there is an AI Readiness Assessment, which is a part of an effort for promoting proactive governance approach, ensuring the nations are informed, prepared and staying ahead to adopt Artificial Intelligence.

For AI adoption, AI readiness must be assessed, to check if the government enables AI environment with prerequisite to adopt AI or not. In addition, follows AI ethics like safety, accountability, transparency and inclusivity or not, to stay safe and enjoy the economic growth.

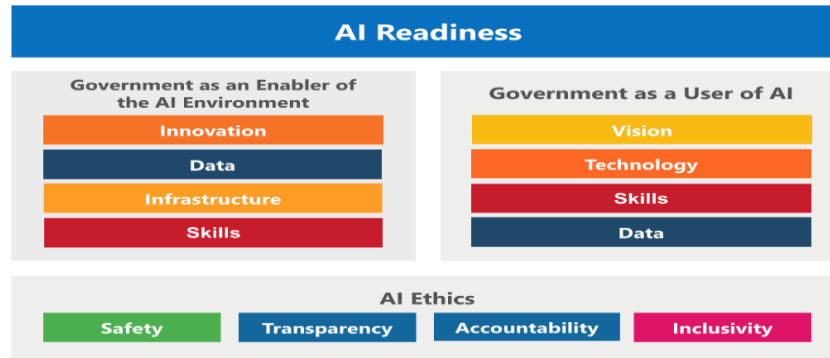


Figure 2: AI Readiness Assessment Source: (Hamdar et al., 2023)

Apart from prerequisites illustrated in Figure 2, designing effective policies, and monitoring them is essential to accomplish sustainable development goals (Hamdar et al., 2023). While comparing the developed and developing economies, the increase of AI readiness gap is highlighted from global trend analyses. Research from the Microsoft AI Economy Institute shows that adoption of AI is higher in high-income countries, while lower-income countries lag due to limited connectivity, capital, workforce skills, and data access. These findings explain the structural challenges faced by Papua New Guinea in leveraging AI for economic transformation (Filippucci et al., 2024).

2.8 Summary

The reviews demonstrate the benefits of adoption Artificial Intelligence in developed and developing countries. There is difference in challenges in terms of infrastructure, institutional readiness, and availability of skills in developing and developed countries.

It is observed that, organizational agility positively regulates the relationship between AI adoption and Employee Engagement. The reviewed papers agree AI has transformative potential to boost economic development. In PNG context, immediate action is needed to improve AI literacy in universities and workforce programs, including infrastructure building and speech models.

3. Methodology

3.1 Research Approach

This study uses government reports, online news, and peer-reviewed papers for exploring AI adoption in PNG sectors, based on three framed research questions (i.e., RQ1, RQ2 and RQ3).

3.2 Data Sources

The used data sources are DICT Digital Government Plan, TPA metrics, ICSA case study, and

Microsoft diffusion data.

3.3 Analytical Framework

The data used to answer the research questions is as follows:

1. *RQ1 Analysis* will use case studies of PNG's sectors.
2. *RQ2 Analysis* will use Governance maturity model.
3. *RQ3 Analysis* will review challenges and opportunities to quantify PNG constraints.

3.4 Limitations

- Not enough secondary data (from 2025 to 2026).
- Survey or interviews are not conducted, instead only available government report, online news, peer-reviewed papers and policy documents are used.
- The focus is limited only to PNG's priority sectors.

4. Challenges, ethics, and policy considerations

4.1 Infrastructure Barriers

It is a fact that PNG is facing structural challenges despite growing interest in AI, which is limiting effective AI adoption, where the main challenges are uneven digital infrastructure, like only the urban regions have internet connectivity and reliable electricity, while the rural and remote areas experience inconsistent or limited access. Thus, it is a digital divide restricting data cloud access, collection, and real-time analytics, which are the core requirements of Artificial Intelligence deployment. Therefore, it is essential to reinforce the regional inequalities that cater AI adoption risks, by prioritising infrastructure development along with digital innovation initiatives (Papua New Guinea | World Bank Group, 2026).

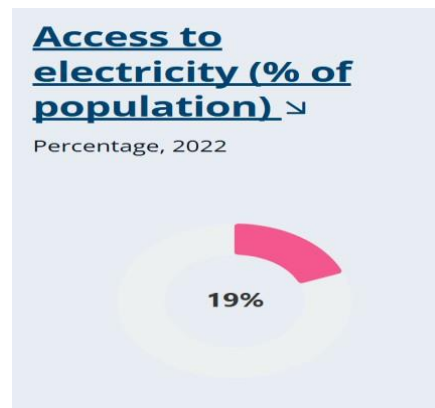


Figure 3: Access to electricity in PNG in %

Source: (Papua New Guinea | World Bank Group, 2026)

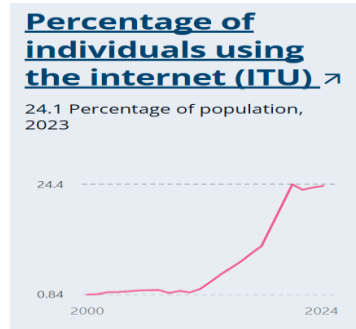


Figure 4: Percentage of individuals using Internet
Source: (Papua New Guinea | World Bank Group, 2026)

4.2 LRLC linguistic challenges

PNG has 840 living indigenous languages, marking the highest linguistic diversity throughout the world (Papua New Guinea, 2025). Now, 12 indigenous languages are extinct. Tok Pisin, is its official language, including English, Hiri Motu, and PNG sign language. For formal education, 23 indigenous languages are served as languages of instruction (Papua New Guinea, 2025).

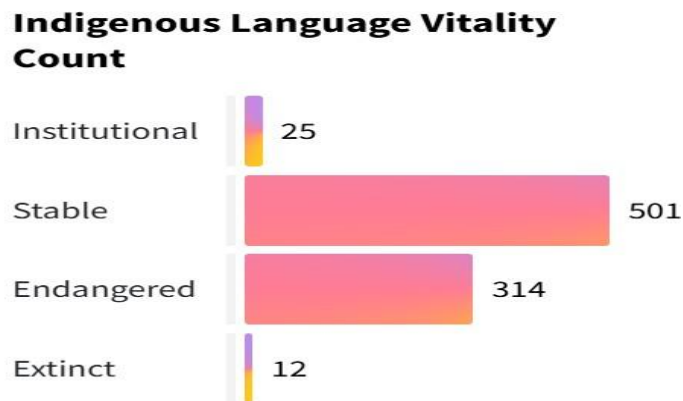


Figure 5: Indigenous language count of PNG
Source: (Papua New Guinea, 2025)

English have significant AI training data; 830+ indigenous languages are still unsupported by LLMs, which impacts LRLCs with ~20% lower diffusion, and it is essential to improve the LLM performance on low-resource languages (Misra et al., 2025).

In general, PNG population faces 95% barriers associated with language translation issues, so using chatbot is not possible, and PNG must build speech models supporting their local languages. Because only the native people can do justice, ensuring right translation of their indigenous languages without any mistakes. In addition, SME chatbots are ineffective again due to indigenous languages spoken by customers. On the other hand, PNG needs Artificial Intelligence tutors, and

this must be addressed with immediate efforts so that the people are provided AI programs in their local languages.

4.3 Human capital and institutional readiness

Apart from the language barrier, limited human capital readiness is the major challenge PNG faces. Digital literacy, analytical capabilities, and data skills are required for AI adoption, yet most of the workforce in PNG is underdeveloped (Ralph, 2025). PNG lack personnel for deploying, interpreting, and governing AI systems in public and private firms. Further, PNG lacks institutional readiness due to fragmented data systems and limited coordination with inter-agencies. Thus, it is necessary to strengthen education systems, institutional capacity, professional training, AI initiatives risk, and pilot-level projects without long-term impact (Ralph, 2025).

The challenges against PNG's peers in Global South to highlight PNG's readiness are explained as follows:

The exhibited Table 2 shows Haiti (7.6% AI diffusion) outperforms PNG (7.3%) though urban concentration, while PNG has higher rural isolation.

- In 2024, Haiti's urban population was 7,119,101 (TRADING ECONOMICS, 2026).
 $7,119,101 \text{ urban (2024)} \div \text{total population} = 59\% \text{ urban}$

- In 2024, PNG's urban population was 13.88% (TRADING ECONOMICS, 2026).

Haiti and PNG are both LRLC within Global South. Haiti is also poor and unstable like PNG, but still Haiti outperforms. The Papua New Guineans have limited internet and are less driven to AI adoption, whereas Haitians have higher internet access and are more familiar to AI. Due to high rural isolation in PNG AI adoption is challenging. Thus, AI adoption crisis of PNG is severe even when compared to similar developing nations. The rural dominance is observed as a key barrier for AI adoption, excluding poverty or instability. Further, PNG is not just "behind Global South average", it has low performance due to high rural isolation and lack of AI readiness.

Table 2: Challenges against PNG and Haiti (LRLC within Global South)

Region/Economy	H2 2025 AI Diffusion	Change (H1-H2)	Key Factors	Results
Global North (Developed Economies)	24.7%	+1.8 pts	High skills, infrastructure	-
Global South (Developing Economies)	14.1%	+1.0 pts	Moderate gaps	-
Haiti (LRLC within Global South)	7.6%	+0.5 pts	Urban concentration (59% urban)	Moderate rural → So, better.

PNG (LRLC within Global South)	7.3%	+0.1 pts	Rural isolation (13% urban, rural dominance is 87%), ⁸⁰ languages	Extremely rural → So, worst.
Global Average	16.3%	+1.2 pts		

4.4 Data privacy, security, and trust

AI systems highly depend on data, which makes data governance a central policy concern. PNG does not have comprehensive data protection legislation like international standards. AI systems highly depend on data, which makes data governance a central policy concern. PNG does not have comprehensive data protection legislation like international standards. Privacy risks and cyber threats can affect businesses, organizations, and individuals, due to lack of personal data protection law. Thus, for AI adoption, unregulated data use and data safety must be avoided, ensuring safety from future cyber threats. Henceforth, clear frameworks must be designed and implemented for consent, cross-border data flow, data ownership, and storage. Thus, PNG must ensure to establish data governance policies associated with PNG's legal and cultural context (Artificial Intelligence, 2026).

A National Data Protection and Governance Policy are developed for cross-border data flows by the DICT, to establish guidelines for transferring personal data to other countries or entities (Papua New Guinea - Digital Economy, 2024).

4.5 Ethical AI use and bias concerns

The adoption of Artificial Intelligence raises ethical concerns associated to data privacy, transparency, accountability, and algorithmic bias. In PNG, trust in public institutions and digital systems is still developing, AI's ethical misuse could undermine public confidence and social cohesion. AI systems trained on incomplete or biased data may disadvantage certain communities, particularly in a culturally diverse society. It is essential to have ethical AI governance, which needs ensuring fairness, explainability, and human oversight in decision-making processes (Ethics of Artificial Intelligence, 2026).

4.6 Policy fragmentation and regulatory gap

While national digital transformation vision in PNG is expressed, yet an AI-specific policy frameworks are underdeveloped. A unified AI strategy is currently initiated which is spread across education, economic development, ICT, and governance domains, leading to inconsistent standards, duplication of efforts, and regulatory uncertainty for businesses and innovators. PNG must design a customized strategy matching the coordinated national AI strategies based on local capacity, which increases effective governance and sustainable adoption (Galindo et al., 2021).

4.7 PNG policy framework

As mentioned earlier in the above section, PNG's vision is to transform its traditional systems into digital technologies, with digital government, data-driven decision-making, innovation ecosystems, and emerging technologies, outlining its strategic priorities to shape the country. All these initiatives direct its aim of modernizing and supporting the growth of private sector via digital platforms. But it is challenging to translate policy plan into practical implementation, especially when PNG is still evolving its digital infrastructure and human capital development. PNG's Digital Transformation Summit targets DGP Plan 2023–2027 and DICT Corporate Plan for SME platforms, and data-driven decision-making, but the evolving infrastructure and skills deficits are causing implementation gaps (Papua New Guinea - Digital Economy, 2024; "CONCEPT NOTE PAPUA NEW GUINEA DIGITAL TRANSFORMATION SUMMIT 2025 (DTS25)," 2025).

4.8 Summary

The challenges, ethics and policy consideration of PNG are explored. PNG has significant geographical distribution, limited infrastructure, limited rural connectivity, gaps in skills development during higher education, and a strong cultural and linguistic diversity (840 languages), increasing the challenges to introduce digital technologies and AI adoption. In addition, has no AI regulations and policies.

5. Results

5.1 RQ1: How is AI transforming PNG's priority economic sectors?

RQ1 Analysis referred case studies of PNG's sectors, representing AI transformation irrespective of barriers (i.e., ICSA MAE = 95% automation, TPA = increased RevPAR in tourism, and CellMoni = MSME Fintech).

5.2 RQ2: What role does AI play in PNG's business innovation and global market competitiveness?

RQ2 Analysis considers Governance maturity model for assessing DICT framework, showing Stage 1, Stage 2, and Stage 3 progression.

AI readiness of PNG is assessed using AI Readiness Assessment (Hamdar et al., 2023). The assessment concluded structural challenges in PNG, which are major hurdles for AI adoption. PNG is at governance maturity model's Stage 1 and must reach stage 3. Despite in Stage 1, tourism has excelled with increased RevPAR through TPA.

5.3 RQ3: What challenges and opportunities exist for PNG's AI adoption?

For PNG to achieve effective and responsible AI-driven economic transformation across priority economic sectors (i.e., entrepreneurship, tourism, leadership, and workforce optimization) there are various challenges.

PNG's Challenges are (Microsoft AI Economy Institute, 2026):

- 1) Lacks infrastructure
- 2) Lacks internet connectivity
- 3) Lacks human capital
- 4) Lacks AI skilled workforce
- 5) Language barrier, due to language diversity
- 6) Gaps in governance

PNG's opportunities are:

Scalable potential of PNG is observed in ICSA and TPA cases. With ICSA MAE, 95% automated visa processing was accomplished, likewise the chatbot for tourism, CellMoni, and AI diffusion of 7.3% helps to understand PNG has potentials to grow. Thus, it must first focus on structural foundation than on advance stages.

The following results were found from the respective case studies.

- ICSA MAE's case demonstrates efficiency.
- TPA cases demonstrated PNG's scalability.
- CellMoni validates the potential of MSMEs.
- DICT helps connect over 100 agencies using GovCloud.
- AI diffusion of 7.3% helps to understand lack of foundational infrastructure. For establishing connectivity and governance in PNG.

6. Discussion

6.1 RQ1: How is AI transforming PNG's priority economic sectors?

AI adoption remains emerging (7.3% diffusion) across PNG sectors due to 86% rural isolation and 840-language barrier but delivers targeted transformation. PNG is at governance stage 1 and must reach stage 3 (of governance maturity model). Across PNG's priority economic sectors, 7.3% AI diffusion establishes the baseline adoption rate. Tourism demonstrates targeted applications despite this low penetration and is displayed in Table 3.

Table 3: AI Diffusion Baseline Across PNG Sectors

Sector	AI Diffusion	Relative to Baseline
All PNG Sectors	7.3%	Baseline
Tourism	7.3%+	Emerging

Entrepreneurship	7.3%	Early stage
Workforce	7.3%	Developing

Source: (Corporate Responsibility, 2026)

1. Tourism

With Pandemic, travel stopped tourists coming to PNG, and this caused resource mismanagement, and disrupted ICT system, so it needed coordinated efforts to position PNG in the competitive destination in the Pacific region. This needed appropriate policies, legislative framework, processes, procedures, and supervisory techniques, so an organizational structure was established by the tourism industry (i.e. Departments and Units), recruits, and train officers to identify and address the risks that threaten tourism sector's stability (Kunjil, 2025).

In PNG, irrespective of 7.3% diffusion, TPA leverages AI to increase the benefits of RevPAR, with the help of UNWTO training programs. Hospitality chatbots handle 80% queries of the customers.

2. Case Studies

Case Study 1: Digital government plan

PNG is progressing in embracing sustainable tourism and digital transformation. Based on the ICT Roadmap of 2018, 2020's PNG Digital Transformation Plan and the Digital Government Act of 2022, wishes to completely digitize and automate all government systems and processes, while extending the penetration of telecommunication coverage to reach about 90 per cent of the population by 2027. The Digital Government Plan includes to ensure (AI Asia Pacific Institute et al., 2024):

- 1) Digital services delivery
- 2) Resilient cyber environment
- 3) Establish and implement digital services standards for public services

As PNG lacks country-specific governing laws for Privacy and Data Protection, they are addressed using the existing laws and National Data Governance. So, Data Protection Policy (2024) was prepared (AI Asia Pacific Institute et al., 2024).

For software engineering curriculum, BRIDGES2023 proposed translation of Open-Source Software (OSS) packages like Firefox/VLC into Tok Pisin, to tackle language barrier and enable AI adoption irrespective of 7.3% diffusion (Cheong et al., 2025).

ICT can strengthen governance, drive economic growth, improve social and political relationships, improve performance, and public service delivery (Sun et al., 2024).

Case Study 2: CellMoni

CellMoni aimed to have cashless economy, so an e-wallet was created on the Digicel PNG mobile number providing services like Domestic Money Transfer, Deposit, Withdrawal, Bill Payments, Top Up Services, and so on (CellMoni, 2023).

The idea was to provide digital financial services to Digicel customers and businesses without a formal bank account, so there are faster and safer financial transactions, and increase financial inclusion's potential significantly in PNG (UNCDF Partners With Digicel's CellMoni to Boost Rural Financial Inclusion in Papua New Guinea - UN Capital Development Fund (UNCDF), 2021).

With CellMoni's e-wallet, Fintech and digital payments can be used for financial transactions in MSMEs, where entrepreneurs can take benefits of digital financial services, supporting digital recordkeeping and credit scoring.

3. Entrepreneurship

Challenges for MSMEs in AI adoption are:

- 1) *Finance availability*: MSMEs need capital, so need strategic investments and partnerships.
- 2) *Connectivity and cost*: AI services can be disrupted due to low penetration and uneven 4G connection than in urban regions. This rural divide must be closed.
- 3) *Digital skills and workforce*: Necessary skills to pool the local talent of PNG population is missing in universities and training institutes.
- 4) *Data availability*: Most of the AI applications depend on reliable, digitized datasets, but PNG has no records, as it is still building them.
- 5) *Governance*: For privacy and trust robust data governance frameworks are required.



Figure 6: AI adoption-based barriers for MSMEs (in Denmark)

Source: (Didachos & Tambunan, 2024)

Figure 6 identifies the required government initiatives for promoting successful AI adoption in MSMEs, contributing sustainability and growth.

PNG population faces 95% barriers associated with language translation issues, so using chatbots. For digital skill development Artificial Intelligence programs and tutors are needed, to teach in local languages.

PNG's diffusion of 7.3% highly limits SMEs in rural areas, where 86% rural isolation blocks the access to AI tools. Even basic functions are expensive for the entrepreneurs in PNG, with only urban Tok Pisin speakers are able to access chatbots. So, PNG needs OSS solutions.

To have a sustainable growth, it is essential to empower the SMEs and entrepreneurs, which can fuel competition and innovation, so empowering them is crucial for employment and sustain global market's value chain, and are vital for communities and for local economies' transition into digital and sustainable future. To make the entrepreneurs and SMEs resilient, OECD collaborate with regions and countries for policy development, support during crises, build strength to handle uncertain business environment, which can increase their potential and transform companies in all the sectors (SMEs and Entrepreneurship, 2026).

4. Workforce systems

Despite National Digital Summits, PNG has slow growth linked to gaps in workforce, because low diffusion is attached to skills deficit.

Table 4: H1 and H2 AI diffusion in 2025

Economy	H1 2025 AI Diffusion	H2 2025 AI Diffusion	Change
Papua New Guinea	7.2%	7.3%	+0.2%

Source: (Microsoft AI Economy Institute, 2026)

Table 4 and 5 exhibits growth which scales to 7.3% from 7.2% via targeted policies, denoting faster adopters.

Table 5: PNG AI Diffusion vs Global Benchmarks (Microsoft H2 2025)

Economy	H1 2025	H2 2025	Change
PNG	7.2%	7.3%	+0.2%
Global South	13.1%	14.1%	+1.0%
Global North	22.9%	24.7%	+1.8%

Source: (Microsoft AI Economy Institute, 2026)

PNG has shown +0.2% growth, indicating development-based barriers like the following:

- Governance lag
- Infrastructure gaps
- Skills deficits

For AI adoption, the basic prerequisites must be prioritized in emerging economies like PNG, enabling institutional capacity, connectivity, and AI literacy than focusing on technological sophistication. To develop economy, an effective PNG model must be designed and implemented by the government (Digital, 2026). On the other hand, though the diffusion is 7.3%, success is seen in immigration and tourism cases, denoting to work on human capital and language constraints.

5. Leadership/Government

AI adoption is higher in high-income countries, whereas lower-income countries lag due to limited connectivity, capital, workforce skills, and data access, explaining the structural challenges faced by PNG to leverage AI for economic transformation (Filippucci et al., 2024).

Diffusion of 7.3% limits the potential of DICT to match the skills, so 2025 Digital Government Platform was removed. Government Cloud connects to over 100 government agencies, but digital literacy gaps and 840 language barrier limit scaling.

Table 6: Summary of Case Studies

Sector	AI Maturity	Key Transformation	Barrier
Tourism	Emerging	Increased RevPAR, Contains 80% chatbot automation	Infrastructure
Entrepreneurship	Early stage	Need Tok Pisin SME tools	Rural isolation
Workforce	Developing	Need to learn AI and digital skills	Digital literacy
Leadership	Emerging	Policy commitment	Governance lag

Source: (Corporate Responsibility, 2026)

The identified effective regulations, policies, programs, and facilities that can be implemented to promote AI adoption in MSMEs are:

- Need government support
- Policymakers must refine their strategies
- Resources must be allocated effectively,
- Continue AI literacy in education system, so AI adoption is possible in MSMEs.
- Must have reliable internet connectivity, stable electricity supply, and, cloud access, which are prerequisites for AI-enabled systems.

6.2 **RQ2:** *What role does AI play in PNG's business innovation and global market competitiveness?*

PNG's *Department of Information & Communications Technology (DICT)* published the *Digital Government Plan 2023-2027* for (Digital Government Plans | DICT I PNG, 2025):

- 1) Open National Cyber Security Centre and establish cybersecurity standards
- 2) Connect over 100 government agencies, through GovCloud
- 3) By 2030, provide internet to 70% population
- 4) Launch G2G, G2B, G2C platforms, as they are six strategic pillars that help to improve digital government services' delivery (Sun et al., 2024).

For DGP 2023-2027 plan to work, efficiency, transparency, engagement of public, and accountability are needed.

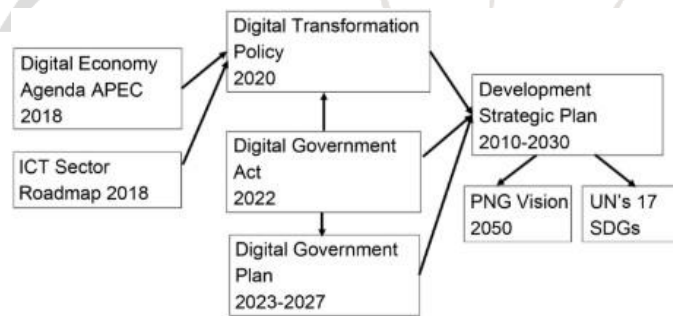


Figure 7: DGP 2023-2027 and connection with other national policies

Source: (Sun et al., 2024)

To answer RQ2, AI Governance Maturity model is considered for PNG, where the barriers of business competitiveness are determined based on three stages depicted in Figure 8.

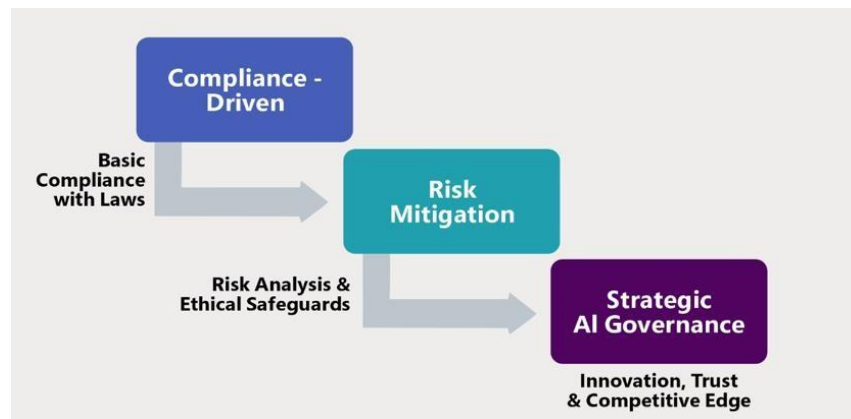


Figure 8: Evolution of AI Governance from Compliance to Strategic Asset

Source: (Singh, 2025)

PNG's Department of Information and Communications Technology (DICT) framework represents

Compliance-Driven governance, and for it to reach Strategic AI Governance, the following three stages must be developed:

Stage 1: *Compliance-driven*: Simply meeting the basic legal and regulatory standards like General Data Protection Regulation (GDPR), California Consumer Privacy Act (CCPA), and International Organization for Standardization (ISO) AI Standards.

Stage 2: *Risk mitigation*: By focusing on risk avoidance, companies use ethical safeguards to prevent things like algorithmic bias, making their processes more transparent, and this ensures compliance in their AI systems.

Stage 3: *Strategic AI governance*: When compared to other two stages, this is an advanced level, where the key business tool is to manage AI, not just a box to tick for compliance.

Companies that use Strategic AI Governance not only stay competitive but also build trust with the public and keep innovation going, while making sure AI is used ethically.

When the businesses incorporate AI privacy and governance practices, they can avoid ethical dangers. Adopting ethical AI guidelines in companies benefit with customer loyalty, reduces regulatory probes, and strengthens investor relationships (Singh, 2025).

AI's role in PNG business innovation remains at an “Early stage” of AI adoption, due to Compliance-Driven governance (DICT Framework 2025). However, businesses will fail to achieve global competitiveness without progressing to Strategic AI Governance in Stage 3, where ethical AI deployment delivers 25 to 30% productivity gains in Least Developed Countries (LDCs).

Currently, PNG's AI/digital policies prioritize the basic legal/regulatory requirements over strategic business enablement. PNG governance gaps are listed below:

- No ethical AI guidelines (bias audits)
- No business innovation frameworks
- No strategic competitiveness roadmaPNG DICT delivers infrastructure compliance but lacks governance maturity model that businesses need for competitive AI innovation. Thus, the AI governance concept answers RQ2 by demonstrating how governance lag creates an AI innovation barrier, requiring strategic maturity to unlock PNG business competitiveness. PNG needs governance maturity model to integrate AI into business innovation and achieve global market competitiveness.

6.3 **RQ3:** What challenges and opportunities exist for PNG's AI adoption?

1. PNG's challenges

Research from the Microsoft AI Economy Institute shows that adoption of AI is higher in high-income countries, while lower-income countries lag due to limited connectivity, capital, workforce skills, and data access, explaining the structural challenges faced by Papua New Guinea in leveraging AI for economic transformation (Filippucci et al., 2024).

PNG has 86% rural isolation and 7.3% diffusion (+0.2%), thus in PNG, there are structural foundational challenges as follows (Microsoft AI Economy Institute, 2026):

- 1) There is no infrastructure
- 2) No internet connectivity
- 3) Lacks human capital
- 4) Lacks AI skilled workforce
- 5) Language barrier, due to language diversity

In addition, PNG has no particular AI regulation or legislations to follow (Papua New Guinea Digital Economy, 2024).

2. Opportunities for PNG

With AI adoption and digitization services, there awaits opportunities of creating an empowered society, having skills, skilled workforce, good infrastructure, internet accessibility, safe and automated government systems and services to all the Papua New Guineans. All the sectors can benefit from AI adoption and promote economic growth (Singh, 2025). For unlocking opportunities, PNG must improve structural foundation and governance phases.

Case Study 3: ICSA MAE

The ICSA case study has set PNG as a digital transformation leader, due to ICSA MAE (The Papua New Guinea Immigration and Citizenship Services Authority & NiuPay Success Story, 2026).

In 2024, MyICSA Analysis Engine (MAE) was launched, a solution used for border management system in PNG through an e-Border Solution Project (e-visa portal), handled by PNG ICSA (Kia & Kia, 2025). With MyICSA Analysis Engine's (MAE) has accomplished 95% automation, and visa processing time has decreased to 4 minutes than weeks (The Papua New Guinea Immigration and Citizenship Services Authority & NiuPay Success Story, 2026). Other benefits of MAE are that it can instantly detect defaulters and decrease wastage of time caused due to missing or incorrect information in the applications (Bulletin, 2026). NiuPay and AWS was used by PNG that decreased the submission of fraudulent documents, using MAE (The Papua New Guinea Immigration and Citizenship Services Authority & NiuPay Success Story, 2026).

In Port Moresby in the year 2025, PNG launched PNG Digital Arrival Card (PNGDAC) and established Immigration Operations Command Centre (IOCC), (Kia, L., & Kia, L., 2025, October 2). It is a milestone for the country, as PNG supports Solomon Islands with this solution for managing its borders, where the entries are digitized, ensuring safe and secured borders (*SI Immigration Division Gets Support from PNG Immigration and Citizenship Service Authority on Border Management System*, 2026).

The discussed case studies prove there are opportunities for PNG's digital transformation and economic growth.

7. Implications for emerging and developing economies

7.1 Regional and international collaboration must be improved, as follows:

- Due to capacity and resource limitation in PNG, government must leverage partnerships with development agencies, regional organisations, and technology providers.
- Monitor the regional economic communities based on the annual reports on Digital Transformation, presenting learned lessons, priorities, experiences, progress achieved, and obtained results (World Bank Group, 2025).
- Along with AI, utilize advanced digital solutions, for improving productivity, administrative transparency and cross-border exchanges, in line with national and regional frameworks jobs (World Bank Group, 2025).

7.2 Strengthening global standing of PNG

Forward-looking skills policies must be implemented by governments, whereas must be embraced by education systems and prioritize digital skills. In addition, employers must invest in training and reskilling their workforce to meet the demands that are evolving (Skills and Lifelong Learning, 2026; EMTV Online, 2025).

- *Long-term strategy*: PNG government must develop and implement a proper syllabus in schools and universities, with AI, cyber security, and other necessary skills, to produce skilled experts in future.
- *Short-term strategy*: Create training programs to upskill workers and fill the workforce gaps.
- *Education's role*: Collaborate with the education sector and strength general and higher education, so that PNG can produce new skilled workforce readiness to meet the demands in future.
- *Language*: PNG must work on developing multilingual LLM, to understand and respond to the queries in PNG's official languages, which helps in overcoming LRLC barriers.
- *Professional skills*: Train professionals in digital technologies and cybersecurity (World Bank Group, 2025).

8. Conclusion and recommendation

8.1 Conclusion

Despite PNG's significant geographical distribution, limited infrastructure, limited rural connectivity, gaps in skills development during higher education, and a strong cultural and linguistic diversity, the adoption of Artificial Intelligence, digital transformation strategies, workforce development, and entrepreneurship skills, can accelerate economic development. Collectively, all the discussed developments can help PNG accomplish sustainable economic development. Thus, PNG needs a clear political will, strategic plan, institutional focus, and for rapid progress.

Currently, PNG is at the starting point of transformation. This study has revealed 7.3% diffusion and limitation by 87% rural isolation, 840 language barriers, and in stage 1 governance (of governance maturity model), yet it shows emerging gains in tourism (increased RevPAR in tourism), amid early-stage entrepreneurship.

Case studies from priority economic sectors were reviewed public, which illustrated to focus on local needs, despite following incremental AI-enabled solutions that improve efficiency, market access, and service delivery.

The findings showed that in PNG, the economic impact of Artificial Intelligence focuses on the basic prerequisites (i.e., digital infrastructure, ethical governance conditions, human capital, workforce skilling, and MSME support) to adopt AI, and not technological sophistication. Incremental solutions in recruitment (like ICOSA), cultural preservation (Tok Pisin models), and policy coordination result in inconsistent return, regardless of structural constraints. The strategic recommendations are national AI curriculum, rural broadband expansion through public-private partnerships, MSME grants, shared AI platform, capacity building, and tax incentives, which reforms PNG's current position. The study concludes PNG to prioritize prerequisites for AI adoption over technological sophistication and adopt locally appropriate AI governance frameworks considering the dispersed populations, linguistic diversity, and limited digital infrastructure to benefit PNG's economic growth.

8.2 Recommendation

A set of strategic recommendations for PNG to support effective and responsible AI-driven economic transformation across priority economic sectors are listed and explained in this part of the study (AI Diffusion Report: Where AI Is Most Used, Developed, and Built, 2025):

1) Infrastructure development

For AI adoption in PNG, strengthen digital infrastructure with the following measures:

- Provide reliable internet connectivity.

- Provide stable electricity supply.
- Deploy regional Internet exchange points (IXPs) for securing data traffic (World Bank Group, 2025).
- The government must take immediate measures to improve rural and underserved regions, by investing in national broadband expansion and decrease digital divide. The world bank offers both knowledge and finance to end global digital divide, subsequently PNG must take advantage of this opportunity (Digital, 2026).
- Provide affordable infrastructure for businesses and communities, by public–private partnerships with mobile network providers (World Bank Group, 2025).
- Provide cloud access.

For cybersecurity, data governance, and Artificial Intelligence, adopt matching frameworks (World Bank Group, 2025).

2) Workforce development

In education and workforce development systems, Artificial Intelligence and digital skills must be integrated.

Education department's help is needed to embed AI literacy in student from primary, secondary and tertiary education. It is necessary to strengthen education systems, institutional capacity, and professional training.

AI can significantly improve the recruitment processes, such as:

- *CV screening*: Resumes can be screened instantly and effectively with Artificial Intelligence, reducing the time of searching right candidate (EMTV Online, 2025).
- *Database integration*: Information is pulled effectively from large candidate databases, to find the candidates looking for specific jobs.
- *Authenticity checking*: Using ICSA, application details' accuracy can be verified (EMTV Online, 2025).
- *Social media analysis*: AI can scan platforms such as LinkedIn, Facebook and other social media and professional platforms within seconds, for the tasks that would take weeks or months, hence increases productivity.

3) Entrepreneurship Development

Promote AI adoption among MSMEs and entrepreneurs. Proactive measures and support must be provided by the PNG government, to implement and promote AI adoption in MSMEs, some of the measures are as follows:

- In developing countries, governments must create favourable environment for the MSMEs/businesses to adopt AI like tax incentives or grants, to invest in AI technologies.
- Implement regulations and policies with safety and privacy.
- Provide access to mentorship, and shared digital platforms, decreasing entry-level hurdles to adopt AI-enabled tools.

- Provide financial support and necessary resources to adopt AI and integrate it in their operations.
- PNG government must focus on capacity-building and training initiatives to help the MSMEs equip right skills and knowledge to leverage AI.
- Provide opportunities like knowledge sharing, technical support, and regional digital strategies, helping PNG adopt AI solutions based on the context that suits PNG.
- Collaborate with industry experts and academic institutions, governments for designing specialized training programs customized based on the MSMEs' needs. Thus, increasing the skills and AI competencies of workforce (Didachos & Tambunan, 2024).
- Invest in skill development, as it can generate dynamic and adaptable workforce, with surplus opportunities.
- Government must facilitate a culture of innovation, ensure regulatory guidance, and capacity building, to enable the widespread adoption of Artificial intelligence across MSMEs, while contributing economic growth and prosperity in PNG.

4) Policy Development

Establish ethical and governance frameworks for responsible AI use.

- National guidelines for ethical AI must be developed by PNG that aligns with international standards, while concentrating on transparency, data privacy, accountability, and inclusiveness.
- PNG must create clear data governance policies and protect citizens' rights.
- Ethical leadership and regulatory clarity in PNG can be built from public trust and responsible private-sector investment.
- Establish data governance policies with PNG's legal and cultural context, to protect data sovereignty (Ethics of Artificial Intelligence, 2026).

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Abbreviation

AI: Artificial Intelligence

BRIDGES2023: Bridging the Divides with Globally Engineered Software

CCPA: California Consumer Privacy Act

DGP: Digital Government Plan

DICT: Department of Information and Communications Technology

FDI: Foreign Direct Investment **G2G:** Government-to-Government **G2B:** Government-to-Business **G2C:** Government-to-Citizen

GDP: Gross Domestic Product

GDPR: General Data Protection Regulation

HR: Human Resource

ICSA: Immigration and Citizenship Services Authority

INF: Inflation

IOCC: Immigration Operations Command Centre

ISO: International Organization for Standardization

IT: Information Technology

IXPs: Internet Exchange Points

LLM: Large Language Model

LRLC: Low-Resource Language Countries

MAE: MyICSA Analysis Engine

MSMEs: Micro, Small and Medium Enterprises **OECD:** Organisation for Economic Co-operation and Development

OSS: Open-Source Software **PMO:** Project Management Office **PNG:** Papua New Guinea

PNGDAC: PNG Digital Arrival Card **RevPAR:** Revenue Per Available Room

SMEs: Small, Medium Enterprises **TPA:** Tourism Promotion Authority