How to Cite:
Brahmia, N. (2025). The role of artificial intelligence in enhancing tax compliance and customs efficiency: A case study of the South African Revenue Service (SARS). *International Journal of Economic Perspectives*, *19*(5), 1881–1893. Retrieved from https://ijeponline.org/index.php/journal/article/view/1016

The role of artificial intelligence in enhancing tax compliance and customs efficiency: A case study of the South African Revenue Service (SARS)

Dr. Nabil Brahmia
University of May 8, 1945 - Guelma, Algeria

***Abstract*---**The integration of Artificial Intelligence (AI) in tax administration and customs operations has become a transformative force in modern revenue services worldwide. However, in the context of South Africa, the adoption of AI by the South African Revenue Service (SARS) remains underexplored due to the lack of comprehensive open data and academic research. This study investigates the current state of AI implementation in SARS, analyzing available reports, IT infrastructure indicators, transparency levels, and cybersecurity readiness. Using a qualitative and analytical approach, this research identifies key challenges hindering the effective deployment of AI in SARS, including technological gaps, insufficient data infrastructure, and cybersecurity vulnerabilities. Furthermore, the study proposes a strategic framework for enhancing AI adoption, emphasizing improvements in IT modernization, data governance, and risk management protocols. Findings indicate that South Africa's current technological and regulatory landscape lags behind global benchmarks, necessitating urgent reforms to harness AI's full potential in tax compliance and customs efficiency. This paper contributes to the emerging discourse on AI in African tax administrations by providing one of the first systematic assessments of SARS' AI readiness, offering actionable insights for policymakers and future research.

***Keywords*---**Artificial Intelligence, Tax Compliance, Customs Efficiency, South African Revenue Service (SARS), Digital Transformation, Cybersecurity.

Corresponding author: *Brahmia, N., Email: brahmia.nabil@univ-guelma.dz*
Submitted: 10 January 2025, Revised: 18 February 2025, Accepted: 10 March 2025

1. Introduction

The Fourth Industrial Revolution (4IR) has ushered in unprecedented advancements in Artificial Intelligence (AI), reshaping industries from healthcare to finance. Among these transformations, revenue and customs administrations worldwide are increasingly leveraging AI to enhance compliance, detect fraud, and streamline operations (Julius & Christabel, 2020). The European Union's iBorderCtrl, Singapore's AI-driven cargo inspection systems, and China's smart customs checkpoints exemplify how AI is revolutionizing border security and tax collection (Chebotareva et al., 2021; Sun, 2021).

Despite these global trends, Africa's adoption of AI in tax and customs administration remains nascent (Novitske, 2018). While countries like Ghana and Nigeria have initiated pilot AI projects, South Africa stands out as one of the continent's pioneers through its SARS Modernization Program. Since 2016, SARS has integrated machine learning algorithms in its Tax Compliance Status (TCS) system, marking a critical step toward AI-driven tax governance (SARS, 2023). However, the extent, effectiveness, and challenges of AI adoption in SARS remain under-researched, primarily due to limited public data and academic scrutiny.

Research Gap and Objectives

This study addresses a critical gap in the literature by:

- **Assessing SARS' current AI capabilities** in tax and customs administration.
- **Identifying systemic barriers** (e.g., IT infrastructure deficits, cybersecurity risks).
- **Proposing a roadmap** for scalable AI integration, aligned with global best practices.

Methodology and Structure

The research employs a mixed-methods approach, combining:

- Document analysis of SARS reports and global case studies.
- Comparative benchmarking against leading AI-driven tax agencies (e.g., Denmark's NLP-based declaration system).
- Policy recommendations for sustainable AI adoption in resource-constrained settings.

By bridging the knowledge gap on AI in African revenue services, this study aims to inform policymakers, tax administrators, and researchers on the strategic imperatives for digital transformation in emerging economies.

1.1 An Overview of South African Foreign Trade

South Africa stands as one of Africa's most significant economies, with foreign trade playing a pivotal role in its economic development. With a GDP of $419.02 billion (World Bank, 2020), it ranks as the continent's second-largest economy after Nigeria. The country actively participates in key international trade

agreements, including membership in the World Trade Organization (WTO) and the Southern African Development Community (SADC), which enhance its trade integration and foster regional economic growth.

South Africa's primary trading partners include China, the United States, Germany, India, and Japan—all major players in the global economy. The country's export portfolio is dominated by precious metals (gold and platinum), minerals (iron ore and coal), vehicles, machinery, and agricultural products. Notably, South Africa is the world's second-largest gold producer and the leading platinum supplier, contributing approximately 75% of global platinum production (World Bank, 2020). These metals are crucial for industrial applications, including jewelry, electronics, and automotive catalysts, reinforcing their significance in international trade.

On the import side, South Africa relies heavily on machinery, chemicals, petroleum products, and vehicles, which are vital for sustaining industrial and technological advancement. While the country maintains a trade surplus with several African nations—such as Namibia, Botswana, Lesotho, and Zimbabwe—it faces a trade deficit with key partners like China, India, France, and Mexico. In 2021, South Africa recorded a current account surplus of $15.57 billion (SARS, 2023), reflecting a positive trade balance overall.

Despite its economic prominence, South Africa's trade facilitation metrics lag behind those of developed nations. According to the World Bank's *Doing Business* (2019) report, the country requires 92 hours for exports at an average cost of $1,257 per shipment—one of the highest export costs globally. Additionally, its Trade Across Borders performance index was rated 59.6, indicating moderate efficiency compared to regional peers but significant room for improvement.

1.2 South African IT Infrastructure

The **Information Technology (IT) sector** constitutes a vital component of South Africa's economy, demonstrating both growth potential and challenges in digital competitiveness. In 2016, the South African government allocated **$229.82 million** toward IT sector expansion (World Bank, 2020), signaling a commitment to technological advancement. The country's IT ecosystem is highly diversified, comprising **over 13,000 IT firms and 3,000 electronics companies**, most of which are small enterprises with fewer than 50 employees (Tech Behemoths, 2022). This prevalence of small and medium-sized enterprises (SMEs) fosters a **competitive and innovative market**, encouraging experimentation with new technologies and business models.

Internet Penetration and Connectivity

As of January 2023, South Africa had **43.48 million internet users**, representing **72.3% of the population**—a **0.8% increase** from the previous year (Data Reportal, 2022). Connectivity speeds have also improved significantly:

- Median fixed broadband speed: 40.12 Mbps (+10.39 Mbps, 34.9% growth YoY)

- Median mobile internet speed: 36.70 Mbps (+6.18 Mbps, 20.2% growth YoY)

Despite these advancements, South Africa's digital infrastructure lags behind global standards, particularly in affordability and rural access.

E-Government and Digital Competitiveness

South Africa ranks **65th out of 193 countries** in the **UN E-Government Development Index (EGDI)** (Department of Economic and Social Affairs, United Nations, 2022), making it the **highest-ranked African nation** in e-governance. The EGDI evaluates three key dimensions:

- ✓ **Telecommunication infrastructure**
- ✓ **Human capital**
- ✓ **Online service delivery**

However, South Africa struggles in broader digital competitiveness. According to the IMD World Digital Competitiveness Ranking (2022), the country placed:

- 58th out of 63 in Technology (measuring regulatory support, investment capital, and IT infrastructure)
- 59th out of 63 in Future Readiness (assessing adaptability, business agility, and IT integration)

These rankings reflect systemic challenges, including slow regulatory adaptation, limited venture capital, and uneven IT infrastructure development.

Future Prospects

While South Africa's IT sector shows dynamic growth in connectivity and entrepreneurship, its global digital competitiveness remains weak. Strategic investments in broadband expansion, digital skills training, and innovation-friendly policies will be critical for bridging this gap.

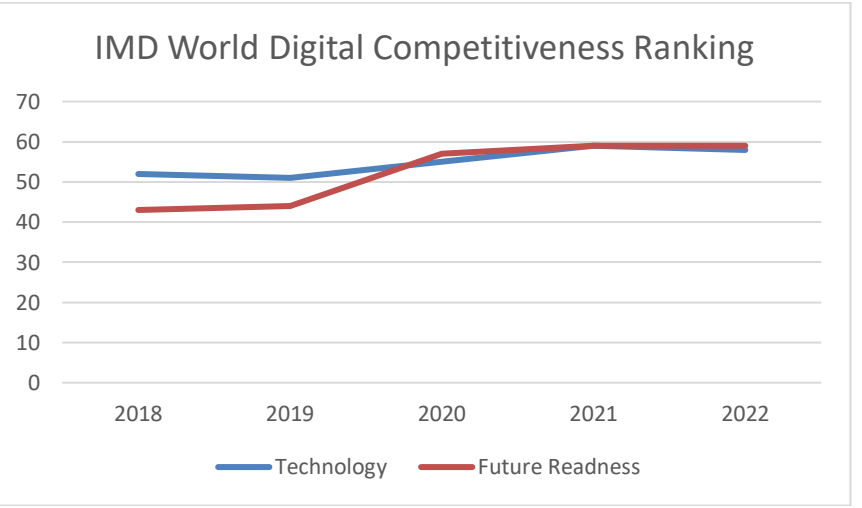

Figure 1. Prepared by researcher based on IMD World Digital Competitiveness Ranking report

1.1 Electricity Energy in South Africa

According to the most recent round of data collection completed in May 2019, South Africa's electricity situation is characterized by 05 required procedures, a lengthy 109-day wait time and a relatively high cost of 158.4% of income per capita to obtain a permanent electricity connection for a newly constructed warehouse. Additionally, the reliability of supply and transparency of tariff index scored 04 out of 08, transparency of tariffs and the price of electricity. Nonetheless, these indicators were measured as part of the "getting electricity" indicators, which aim to provide information on the procedures, time and cost involved in obtaining a permanent electricity connection for businesses. (Doing Business, 2019)

On the other hand, power problems have affected the data centre industry in South Africa,South Africa's data centre industry has been on a growth trajectory in recent years, attracting significant investments from big tech companies like Google, Amazon, Microsoft and Oracle, as well as other data centres infrastructure providers like Teraco, Africa Data Centres and Convergence partners.

According to Africa Data Centres, South Africa will account for the bulk of the $5 billion investment expected to enter the African data centre market by 2026, with the country securing an estimated $3.1 billion in investments by that time. This investment is a significant boost for the South African economy, hence creating jobs and supporting the growth of the country's technology sector. Definitely, the investment in the data centre industry is a sign of confidence in the South Africa's technology sector and its ability to contribute to the country's economic growth. Likewise, it alike stands for an acknowledgment of the growing importance of data centres in modern economies, whereat data is the lifeblood of many businesses.

Despite such growth, however, Ascom faces many challenges, especially in terms of the high volume of debt and the lack of investment, which led it to regular power outages, having disrupted businesses and caused significant economic losses. For data centres, being relying on a constant and reliable power supply, these outages pose a significant risk.

In response, some data centres have invested in their own power supply solutions, inclusive of backup generators and renewable energy sources like solar and wind power. For example, Teraco has installed a solar farm that generates 2.5MW of power, whilst Africa Data Centres has invested in a solar power plant in Nigeria.(Modise, 2023)

1.2 Transparency:

In accordance with the 2022 Transparency International Corruption Perceptions Index (CPI), South Africa ranks 73rdout of 180 countries and territorieswith a score of 43 out of 100.(Transparency International, 2022). The government of South Africa has been criticized for the failure to allocate sufficient financial or human resources for an effective Open Government Partnership (OGP) process. Consequently, this has resulted in minimal dialogue between the government and

civil society, contributing to civil society's further disengagement. Nevertheless, none of the commitments made by South Africa during the 2020 ~ 2022 action plan cycle saw open government results, and the commitments to advance fiscal and beneficial ownership transparency has yet to contain verifiable milestones.

Undoubtedly, South Africa's commitments during the 2020 ~ 2022 action plan cycle aimed to advance transparency around open data, fiscal processes and the beneficial owners of companies. However, the lack of progress in implementing these commitments suggests that transparency remains a significant challenge in the country.(Open Government Partnership, 2022)

1.3 Cyber Security

During its history, South Africa has witnessed several cases of cybersecurity breaches, most notably the South African Police Service data breach in 2013, whereat sensitive information were exposed, including names, addresses and phone numbers of police officers and civilians, in addition to the City Power Ransomware attack in 2019, whereat it exposed Johannesburg's electricity supplier. Further, City Power was attacked by a Ransomwareattack that left power outages in certain parts of the city, where the attackers demanded a ransom in Bitcoins.(SAPS Strategic Management, 2014)

In the same context, there are many other examples of cyber breaches and incidents that have occurred in South Africa in recent years. In virtue of which, this has motivated government and private organizations in the country to invest in improving their defences in the field of cyber security so as to prevent such incidents from occurring in the future.

Additionally, according to the Global Cybersecurity Index 2020, South Africa has shown to be ranking 56thout of 194 countries in terms of its commitment to cybersecurity. Above and beyond, the country has an implemented National Cybersecurity Policy Framework, which was developed in 2012 and revised in 2018. Hence, the aim of the framework is to provide a coordinated approach to cybersecurity across government, industry and civil society.(International Telecommunication Union, 2020)

In terms of data protection legislation, South Africa has the Protection of Personal Information Act (POPIA), which was signed into law in 2013 and came into effect in 2020. Hence, the act aims to protect the personal information of individuals and requires organizations to take appropriate measures to safeguard personal information.(POPIA Act, 2023)

1.4 SARS Data

In the Open Data Barometer, South Africa ranks 22 out of 30 countries. Further, the Barometer seeks to evaluate the progress of governments in adopting and implementing open data policies, as well as the impact of these policies on society. Likewise, the latest edition of the Barometer focuses on 30 governments that have publicly committed to adopting the International Open Data Charter

Principles or the equivalent G20 Anti-Corruption Open Data Principles.(World Wide Web Foundation, 2018)

Increasing and expanding the use of data within a comprehensive framework for knowledge management (Fifth objective) is amongst the strategic goals of SARS. For attainment of this goal, SARS has invested 601,505,000 Rand over the past three years. Hence, this resulted in the automation of the risk detection process in SARS, so that most cases are automatically selected, according to the annual report 2021/2022 for SARS 99.997% of standard cases, and 66.94% of complex cases were created throughout an automated identification process in the South African Revenue Service risk assessment process. (South African Revenue Service, 2022)

Table 01: The automation of the risk detection process in SARS

Product	Total	Automated	Manual	% Automated
Full Scope*	1848	1503	345	81.33%
Limited Scope**	2039	1788	251	87.69%
Customs	1029	0	1029	0.00%
Complex	4916	3291	1625	66.94%
Excise	2704	2704	0	100.00%
Customs	196810	196810	0	100.00%
OpsAudit	2247727	2247653	74	100.00%
Standard	2447241	2447167	74	99.997%
Total	**2452157**	**2450 458**	**1699**	**99.93%**

Source:(South African Revenue Service, 2022)
*Full Scope: An audit case that relates to one or more taxpayers has multiple risks and may span multiple tax types.
** Limited Scope: An audit case relating to a single taxpayer with a focus on one or multiple risks for a tax period not exceeding one year, unless the risk is recurring in nature.

In light of which, this expansion of the use of data will alike improve compliance results based on enhancing the ability to understand the compliance behaviour of taxpayers and merchants (to ensure improved revenues as well), as this expansion in the volume of data allows the enhancement of the accuracy of machine learning algorithms, provided that the approved data is of high quality (complete, consistent, relevant, and timely data). Besides, the South Africa's compliance with international standards for exchange of information on request was rated as "Largely Compliant" with the international standards in Global Forum on Transparency and Exchange of Information for Tax Purposes.

In this context, SARS relied on data from various local and international sources as input to machine learning models and risk profiling alongside case selection, in addition to SARS internal data. Local third-party data sources include banks, pension funds, medical plans, title deeds office, corporate registry, national vehicle registry and supplier database, Central to the National Treasury as well as the National Population Register.

In reality, the international data sources include the automatic exchange of information on South Africans with offshore financial assets from nearly 100 foreign jurisdictions, as well as numerous mutual administrative agreements together with sister organisations.

Recently, SARS has been supported by a system of lifestyle audits. Essentially, these audits include individuals whose lifestyle does not match their tax returns, so that the light is shed on individuals who have access to luxury assets and extensive business relationships. Until 2022, 25 cases were evaluated, with a value of a total valuation of R474.7 million ($25.9 million), these audits are based on social media and open source data.(South African Revenue Service, 2022)

1.5 AI in South African revenue service:

Relying on Artificial Intelligence in African customs authorities still in the exploration stage. Until now, there are a few African countries that have already begun to rely on Artificial Intelligence in some customs tasks such as risk analysis. Above and beyond, the revenue service in South Africa is among these countries that update its systems so as to allow for greater reliance on Artificial Intelligence in a wider segment of customs tasks each time.

For the purpose of supporting tax compliance, there was a need to rely on Artificial Intelligence in developing the risk analysis system, as SARS became using machine learning algorithms to analyze taxpayer data and classify them according to the degree of risk so as to determine which of them is the highest risk (this means the most likely to violate the tax laws in South Africa), as well as detect fraudulent activities, inclusive of tax evasion or money laundering, through identifying anomalies and patterns associated with these cases, as SARS uses predictive modelling techniques in order to evaluate tax returns or discrepancies that may indicate false advertisements.(South African Revenue Service, 2022)

For improvement purpose of customer service and specifically to enhance customer engagement, SARS has introduced AI-powered virtual assistants represented in Chatbotsbased on Natural Language Processing (NLP), to understand and respond to taxpayer inquiries, together with providing them with accurate information about tax laws and regulations. As consequence, all this aims to provide 24/7 customer support, both on its websites and social media platforms, thus allowing taxpayers to obtain answers to frequently asked questions in a quickly manner without having to wait for a response from human agents.(South African Revenue Service, 2022)

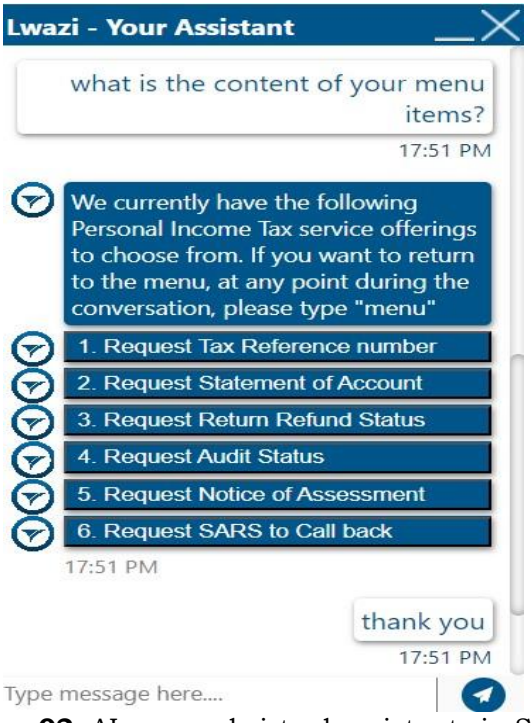

Figure 02: AI-powered virtual assistants in SARS
Source: https://www.sars.gov.za/

In the same context, machine learning algorithms made it possible to divide and classify taxpayers into segments based on their compliance history and behaviour, which ranges from permanent compliance to non-compliant constantly. Thus, these compliance assessments based on internal data archived for SARS allow different strategies to be followed to deal with each type of taxpayer separately.(South African Revenue Service, 2022)

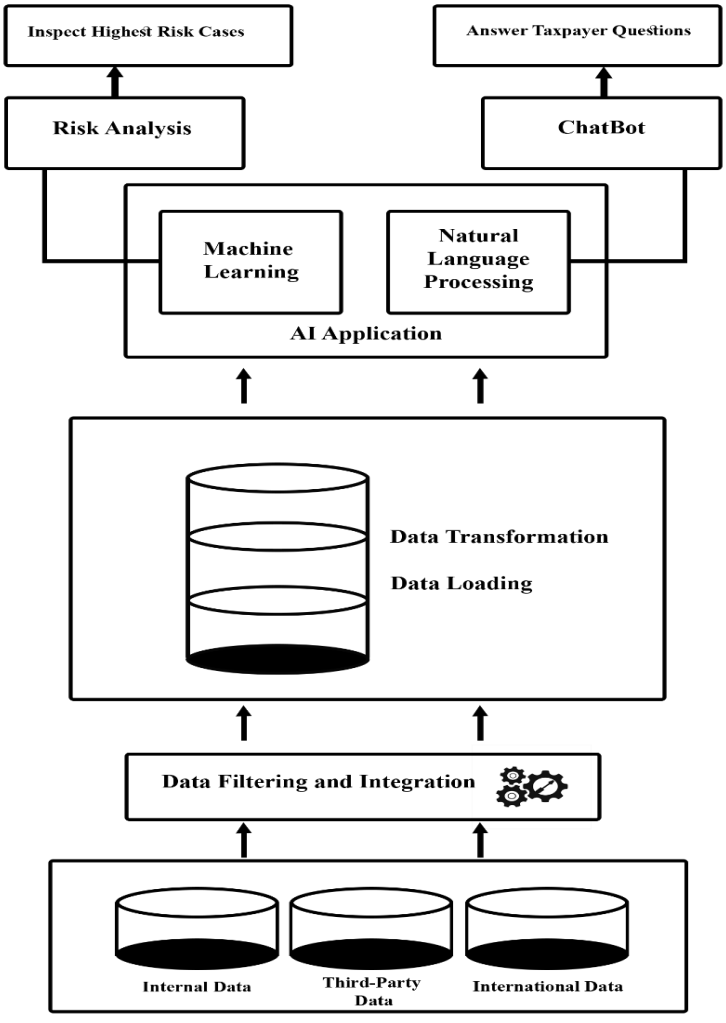

Figure 03: The use of AI in SARS
Source: Prepared by Researcher

2. Discussion

In terms of trade facilitation, South Africa's performance can be assessed as "low", whether compared to African countries or at the global level. Furthermore, the high cost of exports in South Africa could be due to several factors, such as inefficient transportation systems, lack of modern infrastructure and bureaucratic procedures that make it difficult and expensive to export goods. Consequently, these factors could make it difficult for South African companies to compete in the global marketplace, and could alike discourage foreign investment in the country.

Undeniably, extending the use of AI in SARS to fully include customs risk management (rather than just analyzing risk) would improve trade facilitation indicators all the way through reducing waiting times for traders and reducing trade costs.

Analysis of IT infrastructure shows that despite South Africa making significant investments in this sector, and despite the rapid development of the Internet in the country in the form of a growing number of Internet users and an increase in average Internet speeds for both fixed and mobile connections. Nevertheless, South Africa's performance index for e-government indicates that there is an urgent need for further improvement and work on communication infrastructure and services via the Internet.

The Digital Competitiveness Report paints a disturbing picture about South Africa's ability to create a comprehensive context facilitating the development of digital technologies and questions the country's ability to exploit digital transformation and digital readiness factor among the 63 countries included in the report.

On the other hand, the state of electricity in South Africa poses a challenge to improving the information technology infrastructure in South Africa, as the factors of long waiting times and the high cost of obtaining a permanent connection to electricity, in addition to the lack of reliability of supply and transparency in tariff pricing, negatively affect the performance of companies active in the IT sector in general, and in front of data centres in particular.

On the data side, the situation is more optimistic. Despite energy problems and unreliable electricity supply causing business disruption and corporate losses, the data centre industry in South Africa has shown resilience and adaptability by investing in its power supply solutions. With regards to SARS data, despite the increase and expansion in the use of data, which led to the enhancement of Artificial Intelligence capabilities in improving taxpayer compliance and detecting fraud cases, there exists a lot of rooms for improvement in terms of adopting and implementing open data policies, as 22 out of 30 countries rank in open data barometer, This rankingis an evaluation below average, the fact of which is confirmed by the lack of any progress in implementing South Africa's commitments during the 2020 ~ 2022 action plan cycle, which aimed to enhance transparency about open data and financial operations, as this implies that transparency poses a major challenge to the country in particular in light of its late ranking in the Transparency International's Corruption Perceptions Index (73 out of 180 countries).

Despite South Africa's efforts to enhance its cybersecurity, it is required that efforts be redoubled to improve and remedy its lag in the cybersecurity index, as its ranking of 56 out of 190 countries confirms that it is still far from the level of developed countries in the same field. More to the point, it is alike required to focus efforts on enhancing cybersecurity on the most vulnerable sectors thereof, which will not be difficult to identify, given the existence of many historical precedents for cybersecurity breaches in South Africa.

Currently, Artificial Intelligence is used in SARS in two main aspects: risk analysis and customer service improvement, and depends on two different branches of Artificial Intelligence, which are machine learning and natural language processing. Likewise, there is still a possibility to expand the use of Artificial Intelligence in many other customs tasks of SARS and to adopt many other branches of Artificial Intelligence, provided that it is committed to continuously working to neutralize the challenges facing its information technology infrastructure.

3. Conclusion

The initiative of the SARS agency to rely on Artificial Intelligence, for enhancement purpose of its performance, remains a positive point, even in light of the challenges facing the information technology infrastructure, and in light of the limitations of this infrastructure in the African continent in general. Above and beyond, Artificial Intelligence is among the enablers and solutions that are helping South Africa to improve trade facilitation as it needs to reduce costs and time for exporters and importers.

Additionally, South Africa's focus on employing Artificial Intelligence to improve compliance at the expense of trade facilitation reflects the African trend of developing countries whose economies depend heavily on taxes. In the long run, this trend could negatively affect the attractiveness of the investment environment for South Africa, as it incurs investors' additional costs and time larger, which makes them divert their attention towards investing in other countries that are more attractive in this aspect.

Based on SARS's endeavour to expand the use of Artificial Intelligence in its tasks, it is in dire need to strengthen its cyber security, as Artificial Intelligence systems can be vulnerable to hostile attacks aimed at manipulating data to mislead or deceive the Artificial Intelligence system or tamper with the output of the system.

As for transparency, it has in general shown to be weak in South Africa. Likewise, transparency is an important component for the development and deployment of the responsible and effective Artificial Intelligence systems. More and more, transparency builds trust in the Artificial Intelligence systems between users, stakeholders and the public, together with improving the accountability of these systems so as to ensure that they fairly and accurately operate, in the interests of all stakeholders.

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