

Effectiveness and efficiency of artificial intelligence in boosting customs performance: a case study of RECTS at Uganda Customs administration

Kugonza Julius and Mugalula Christabel

Abstract

The artificial intelligence (AI) revolution has great economic potential for customs operations. Indeed, some have already hailed AI ‘the new oil’ since it has become a resource for businesses to streamline processes. This may be an imperfect analogy, but it does capture the excitement and high expectations surrounding the AI-driven economy.

AI is a sub-field of computer science that enables intelligence exhibited by machines. For example, in the East African community, the Regional Electronic Cargo Tracking System (RECTS) is used to monitor cargo in transit from Mombasa in Kenya through Uganda to Rwanda and now in the Democratic Republic of Congo (DRC). This has transformed transit cargo management through deterring of dumping and diversion of transit cargo in real time. Previously, cargo would sometimes, if not most of the time, go unaccounted for while in transit, which caused government revenue leakage and business losses.

This paper examines the global standards and actions in the uptake of AI for trade facilitation in smoothing customs operations. This study looks at how the uptake of AI has affected customs administration in terms of transit management and security of cargo as well as trade facilitation, which greatly reduces the cost of doing business by the private sector.

Based on the study findings, the paper offers several recommendations for policy makers, including undertaking Private Public Partnerships (PPP), integration of RECTS with other Customs systems, well-planned change management and developing a pool of AI experts in Customs.

1. Introduction

1.1 Background

Artificial intelligence (AI) traditionally refers to an artificial creation of human-like intelligence that can learn, reason, plan, perceive or process natural language (Internet Society, 2017). Artificial intelligence is not one specific technology, but rather a broad spectrum of computer systems and applications that have the ability to perform tasks associated with human intelligence (Hulko, 2018). Artificial intelligence is devoted to making machines intelligent, and intelligence is that quality that enables an entity to function appropriately and with foresight in its environment (Nilsson, 2010).

The AI revolution has great economic potential globally. Indeed, some have already hailed AI ‘the new oil’ since it has become a resource for businesses to streamline processes to help us personally achieve more than we currently do, by augmenting our individual cognitive ability with new tools to increase our own productivity. This may be an imperfect analogy, but it does capture the excitement and high expectations surrounding the AI-driven economy. It is projected that the worldwide market for AI solutions could be worth more than GBP£30 billion by 2024, boosting productivity by up to 30 per cent in some industries, and generating savings of up to 25 per cent (PBLINK, 2018). In another estimate, ‘AI could contribute up to USD\$15.7 trillion to the global economy in 2030, more than the current output of China and India combined. Of this, \$6.6 trillion is likely to come from increased productivity and \$9.1 trillion is likely to come from consumption-side effects’ (Hall & Pesenti, 2017, p. 10).

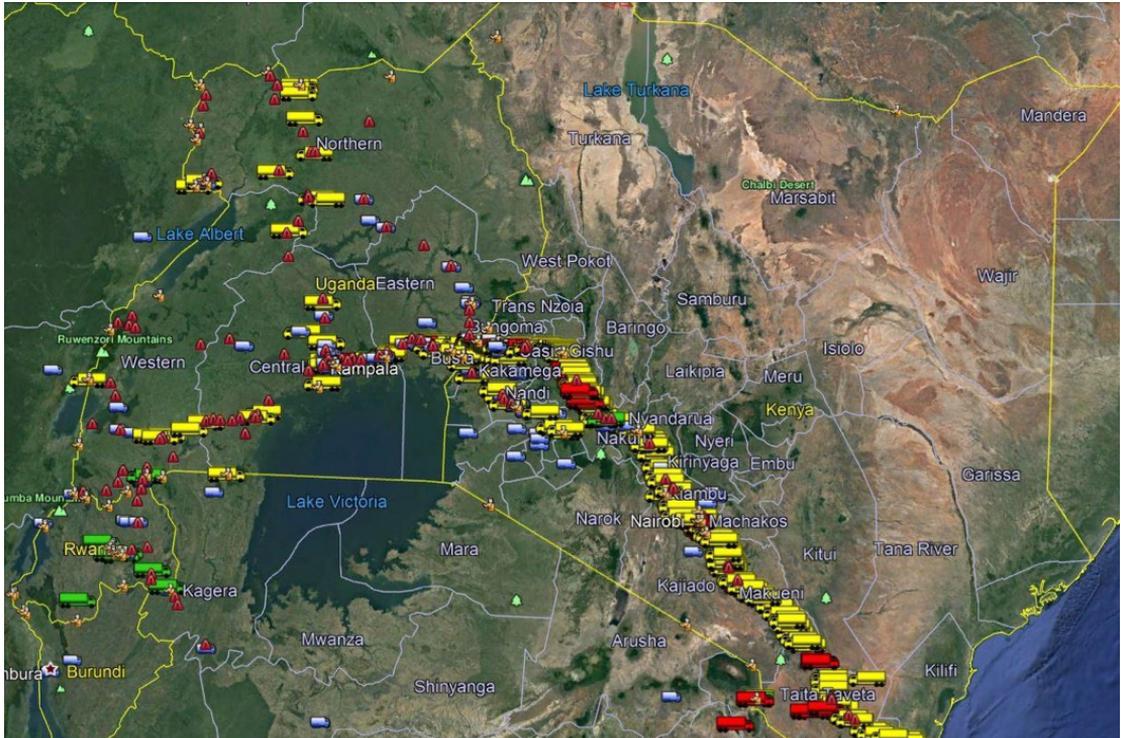
Customs business is not exceptional to the AI revolution. Customs processes urgently require an AI intervention given that they are of critical interest to governments due to their trade and national security significance. The current manual processes overseeing the majority of customs operations can easily miss risky trade and declaration profiles potentially putting nations and their trade apparatus at huge risk (Kumar, 2019). The large amounts of sophisticated information that flow across borders require AI systems to read texts at a high speed, recognise relevant terms, interpret the context and draw conclusions from it. This will help customs administrations realise their strategic objectives, that is, a smarter way of securing borders, protecting society, ensuring full payment of taxes, and strengthening economic competitiveness.

AI in customs operations includes the use of machine learning, neural networks, natural language processing (NLP), and deep learning among others which helps to create intelligent machines that work and react like humans, but with higher accuracy and efficiency. An example of intelligent AI-powered customs innovations in East Africa is the Regional Electronic Cargo Tracking System (RECTS) hosted in the regional customs administrations of Uganda, Kenya, Rwanda and the Democratic Republic of Congo (DRC). These customs administrations use this single platform, which enables them to have a single watch and view of cargo during its movement along the northern corridor. Only one seal is used, which removes the need for arming and disarming the e-seals at partner states’ territorial borders.

RECTS operates in real time through neural networks, a branch of AI. This enables the AI-powered system to make use of the Global Positioning System (GPS), a satellite-based navigation system that provides reliable real-time transit data coordinates on the positioning and navigation of transits along the northern corridor. The positioning transit data is then analysed through algorithms embedded in machine learning, a subset of AI, and the results are then used alongside the gazetted geofenced route coordinates to detect any transit violations, such as going off-route, seal tampering or breaking at any of the customs central command centres in the partner states.

Figure 1 below illustrates trucks armed with e-seals on the northern corridor from Mombasa Port destined to Kenya, Uganda, Rwanda, South Sudan and DRC. Yellow and red truck images show trucks carrying both imports and exports, respectively, that are on the agreed predestined route with e-seals intact. The triangular red exclamation marks indicate hot spots with a previous history of fraud and tampering of e-seals on trucks which require urgent customs intervention through the Rapid Response Units within the respective partner states since the e-seals are tampered with.

Figure 1: Illustration of trucks armed with e-seals along the Northern Corridor



Source: URA Central Command Center 2020

1.2 Problem statement

The cargo transit operations across the five land-linked developing countries of Uganda, Rwanda, Burundi, the DRC and South Sudan involved, for a long time, a convoy system, characterised by paper-based controls, transit log sheets, physical escorts, and transit check points (Balamaga, 2019). Balamaga (2019) further asserted that this transit system was overwhelmed by various impediments to the seamless flow of cargo that included, among others, unnecessary delays, a high cost of doing business, non-tariff barriers, transit diversion, high administrative monitoring costs, and information-sharing gaps between the partner states.

Raballand (2012) added that as the private sector does not seem to have an interest in reducing dwell time in Sub-Saharan Africa, the interests of controlling agencies like Customs collude at the expense of traders. This is further worsened by the transit cargo theft problem, which has intensified in the past decade due to the increased value of cargo.

2. Global standards and actions in the uptake of AI

Standards, particularly those developed by existing international standards bodies, can support the global governance of AI-powered solutions like RECTS development and play an important role in facilitating the adoption of new technologies in customs administrations. Mandatory minimum standards are set to ensure AI-powered solutions meet a threshold for product performance and/or safety and to avoid undue risks for consumers. Some of the global standards that were taken into account when developing RECTS are set out below.

2.1. Adherence to existing human rights frameworks

Human rights are the foundation of human existence and coexistence. Human rights norms provide a framework for equality and non-discrimination that, when objectively applied, ensures that the benefits of human development reach even the most disadvantaged people. AI systems should therefore be designed in a way that respects the rule of law, human rights, democratic values and diversity, and they should include appropriate safeguards—for example, enabling human intervention where necessary—to ensure a fair and just society (OECD, 2019a). AI actors should respect the rule of law, human rights and democratic values, throughout the AI system lifecycle. These include freedom, dignity and autonomy, privacy and data protection, non-discrimination and equality, diversity, fairness, social justice, and internationally recognised labor rights (G20, 2019).

As customs administrations adopt AI to promote the seamless movement of goods through secure international trade supply chains, the development process of AI systems should ensure that AI should not be used to diminish the data rights or privacy of individuals, families or communities (UK Government, 2019). The General Data Protection Regulation ensures a high standard of protection of personal data and requires the implementation of measures to ensure data protection by design and by default (Regulation (EU) 2016/679).

2.2. Inclusive growth, sustainable development, and wellbeing

AI has the potential to improve the welfare and wellbeing of people, to contribute to positive sustainable global economic activity, to increase innovation and productivity, and to help respond to key global challenges (OECD, 2019b). AI systems should support individuals in making better, more informed choices in accordance with their goals. They should act as enablers to a flourishing and equitable society by supporting human agency and fundamental rights, and not decrease, limit or misguide human autonomy. The overall wellbeing of the user should be central to the system's functionality; AI is not an end in itself, but a tool that has to serve people with the ultimate aim of increasing human wellbeing (European Commission, 2019).

Stakeholders should proactively engage in responsible stewardship of trustworthy AI in pursuit of beneficial outcomes for people and the planet, such as augmenting human capabilities and enhancing creativity, advancing inclusion of underrepresented populations, reducing economic, social, gender and other inequalities, and protecting natural environments, thus invigorating inclusive growth, sustainable development and wellbeing (OECD, 2019b; G20, 2019).

2.3. Ensuring accountable and responsible design

The automation of customs procedures is an important part of reform and modernisation efforts, as automated systems are one of the main integrity controls within customs administrations. AI can facilitate audits and reviews of decisions by customs officials, and automation of a wide range of processes can be used to increase transparency and accountability in customs administrations (OECD, 2016). AI systems

should therefore be held accountable for their proper functioning in line with the above principles. Mechanisms should be put in place to ensure responsibility and accountability for AI systems and their outcomes, both before and after their implementation. The audit ability of AI systems is key in this regard, as the assessment of AI systems by internal and external auditors, and the availability of such evaluation reports, strongly contributes to the trustworthiness of the technology. External auditability should especially be ensured in applications affecting fundamental rights, including safety-critical applications (European Commission, 2019).

Potential negative impacts of AI systems should be identified, assessed, documented and minimised. The use of impact assessments facilitates this process. These assessments should be proportionate to the extent of the risks that the AI systems pose. Trade-offs between the requirements, which are often unavoidable, should be addressed in a rational and methodological manner, and should be accounted for. Finally, when unjust adverse impacts occur, accessible mechanisms should ensure adequate redress (European Commission, 2019).

AI actors should be accountable for the proper functioning of AI systems and for the respect of the above principles, based on their roles, the context, and consistent with the state of art practices (G20, 2019).

2.4 Transparent technology

Transparency and predictability of regulations and procedures at borders are widely recognised as essential elements of trade facilitation.¹ Transparency and predictability are the starting point for ensuring the efficiency and, ultimately, the stability of a rules-based environment for goods crossing the border (WCO, 2017). The trustworthiness of AI systems is likewise a key factor for the diffusion and adoption of AI, and a well-informed whole-of-society public debate is necessary for capturing the beneficial potential of the technology, while limiting the risks associated with it (OECD, 2019b). There should be transparency and predictability around AI systems to ensure that people understand AI-based outcomes and can challenge them.

AI actors should also commit to transparency and predictability regarding AI systems. They should provide meaningful information, appropriate to the context, and foster a general understanding of AI systems, to make stakeholders aware of their interactions with AI systems, including in the workplace. They should also enable those affected by an AI system to understand the outcome and enable those adversely affected by an AI system to challenge its outcome based on plain and easy-to-understand information on the factors, and the logic that served as the basis for the prediction, recommendation or decision (G20, 2019). Also, all citizens have the right to be educated to enable them to flourish mentally, emotionally and economically alongside AI (International Telecommunication Union, 2018).

These principles are supported by Chapter 9 of the General Annex of the Revised Kyoto Convention (RKC) (Information, Decisions and Rulings supplied by Customs), which contains numerous standards regarding transparency and predictability. The WCO (2017) *Transparency and predictability guidelines* also highlight the importance of transparency and includes a checklist on this matter.

2.5 Privacy and data governance

Customs administrations should ensure that confidential or commercially sensitive information is not divulged (WCO, 2017) unless such disclosure is required or authorised by national legislation.

Privacy and data protection must therefore be guaranteed at all stages of the AI system's life cycle. Digital records of human behaviour may allow AI systems to infer not only an individual's preferences, age and gender, but also such things as their sexual orientation and religious or political views. To allow individuals to trust the data processing, it must be ensured that they have full control over their own

data, and that data concerning them will not be used to harm or discriminate against them. In addition to safeguarding privacy and personal data, requirements must be fulfilled to ensure high-quality AI systems.

The quality of the datasets used is paramount to the performance of AI systems. When data is gathered, it may reflect socially constructed biases, or contain inaccuracies, errors and mistakes. This needs to be addressed prior to training an AI system with any given dataset. In addition, the integrity of the data must be ensured. Processes and datasets used must be tested and documented at each step such as planning, training, testing and deployment. This should also apply to AI systems that were not developed in-house but acquired elsewhere. Finally, access to data must be adequately governed and controlled (European Commission, 2019).

2.6 Robustness, security and safety

The WCO security initiative is to facilitate members' activities to implement measures—whether standards, guidance, IT tools, operations or specialised training—to enhance border security and management capacities in a holistic manner. AI systems should therefore be robust, secure and safe throughout their lifecycle so that, in conditions of normal use, foreseeable use or misuse, or other adverse conditions, they function appropriately and do not pose unreasonable safety risks. AI actors should also ensure traceability, including in relation to datasets, processes and decisions made during the AI system lifecycle, to enable analysis of the AI system's outcomes and responses to inquiry, appropriate to the context. Further, AI actors should, based on their roles, the context, and their ability to act, apply a systematic risk management approach to each phase of the AI system lifecycle on a continuous basis to address risks related to AI systems, including privacy, digital security, safety and bias.

2.7 Diversity, non-discrimination and fairness

Datasets used by AI systems (both for training and operation) may suffer from the inclusion of inadvertent historic bias, incompleteness and bad governance models. The continuation of such biases could lead to (in)direct discrimination. Harm can also result from the intentional exploitation of (consumer) biases or by engaging in unfair competition. Moreover, the way in which AI systems are developed (for example, the way in which the programming code of an algorithm is written) may also suffer from bias. Such concerns should be tackled from the beginning of the system's development. Establishing diverse design teams and setting up mechanisms ensuring participation, in particular of citizens, in AI development can also help to address these concerns. It is advisable to consult stakeholders who may directly or indirectly be affected by the system throughout its lifecycle. AI systems should consider the whole range of human abilities, skills and requirements, and ensure accessibility through a universal design approach to strive to achieve equal access for persons with disabilities.

3. Challenges in the uptake of AI in customs operations

In this section we identify the main challenges that may be experienced for the uptake of AI-powered solutions like RECTS in customs operations.

3.1 Change management over anticipated job loss

Change is a transition from one state to another with a focus on being different. Managing change *is* tough, but part of the problem is that there is little agreement on which factors most influence transformation initiatives. Ramosaj et al. (2014) showed that changes that are happening in businesses dictate the changes in all kinds of needed resources thereafter. They further discuss that managing AI changes may therefore be a challenge that administrations are likely to face because employees may

have negative attitudes towards them, especially those who have become used to operating in the same way over a long period of time. They also argue that this may be related to the fear of job losses and/or a reduction in income.

Galbraith (2018) highlights the uncertainty created when management does not communicate well, which disrupts work and makes employees feel as if they are not a part of the decision. This may be worsened by the fact that employees dislike change unless it is one that they have requested or lobbied for hence their involvement during the transition. Galbraith also points out that employees need to understand which duties and responsibilities will continue as normal and which ones will change. As far as indirect changes are concerned, employees need to be aware of the changes occurring throughout the organisation and how they may impact their job function.

3.2 Skills gap and a shortage of AI researchers

Despite the fast growth of AI technology, few countries—including developed countries—have the education and skills systems in place to equip their workers to reap the benefits of AI (Access Partnership, n.d.). Importantly, skills shortages foster growing competition, as companies and institutions vie to attract and retain talent, a trend that is affecting both the domestic and international labour markets (UNESCO, 2019). This argument is supported by survey results in New Zealand showing that 44 per cent of survey respondents considered education a key barrier to AI adoption. The report further pointed out that traditional education providers are not yet providing the skills and training required to develop AI excellence in New Zealand (AI Forum of New Zealand, 2018).

Attracting leading AI researchers will be challenging due to growing global demand for AI talent. Therefore, it is essential that Customs, through the WCO, actively competes for talent or risks becoming merely a downstream consumer of AI research from other countries.

3.3 Capital investments in AI research and development needed

While the benefits of digitalisation may be clear, in the short term the transition usually increases costs and the gains may take some years to materialise, and this kind of spend can be politically hard to justify (ICEAW, 2019). A company venturing in AI solutions should objectively assess the level of research and development it can bear both psychologically and financially (Slesar, 2019).

Davenport (2020) notes that the key driver of lack of return from AI is the simple failure to invest sufficiently. Fabian (2017) also notes that as assessing AI technologies is challenging, many investors are hesitant to invest because most venture capital firms are risk-averse and do not invest in something they do not understand. He further adds that many AI companies receive plenty of attention but not enough funding.

3.4 AI legislation and regulation

The European Union (EU, 2019) reported that, to build trust for the usage, adoption and development of AI across society, the UK government is putting in place governance regimes for data-driven AI. This includes the development of ethical guidelines for a sustainable, transparent, replicable use of AI with clear definitions on responsibilities, liabilities, and data protection issues.

In 2017, Elon Musk pointed out the need for caution when implementing AI because there should be some regulatory oversight of AI at the national and international level (Vincent, 2017). His view was also supplemented by Oxford philosopher Nick Bostrom who believed that just as humans out-competed and almost completely eliminated gorillas, AI will outpace human development and ultimately dominate and therefore needs to be regulated (Etzioni & Etzioni, 2017).

Without a proper legal basis for the collection of information, the use of electronic data as evidence and the requirement for data to be supplied in a given format, taxpayers will lack the certainty they need to plan their compliance activities and may resist or refuse to comply with the authority's requests (ICAEW, 2019). Importantly, legally, organisations must obtain consent to collect, use and disclose an individual's personal information, subject to a list of specific exceptions, and obtaining meaningful consent has become increasingly challenging in the age of big data, the Internet of Things, artificial intelligence and robotics (Office of the Privacy Commissioner of Canada, 2017).

3.5 Better national coordination required geographically

The AI Forum of New Zealand (2018) reported that New Zealand, a small country with limited resources, should consider a coordinated national approach to AI research. The findings of the research pointed towards the Canadian AI strategy as a model to emulate.

One of the key priorities of the European Commission's Coordinated Plan on AI is to encourage member states to develop their national AI strategies by the end of 2019, outlining investment levels and implementation measures.

3.6 Limited infrastructure

The Swedish strategy emphasises the need for a digital infrastructure to harness the opportunities that AI can provide, including both a high-quality data infrastructure and a well-developed digital and telecommunication infrastructure in terms of computer power, connectivity and network capacity (Government Offices of Sweden, 2018).

A lack of data infrastructure and the inability to effectively analyse vast swathes of intelligence are among the challenges that are forcing global manufacturing firms to rethink their AI implementation projects (*The Manufacturer*, 2020).

4. Regional electronic cargo tracking system case study in Uganda

4.1 Background

Customs transit involves permitting goods to move under customs control from one customs office to another in the same customs territory or another customs territory, without collecting duties and taxes and without applying economic prohibitions or restrictions, or other commercial policy measures (WCO, 2014). A functional transit system is essential for trade connectivity within the region, particularly for landlocked countries where most of their trade is with countries outside the region and moves in transit through their neighbouring countries (Yasui, 2013).

Transit inefficiency is a result of a variety of factors, such as inadequate interconnection of the existing customs management systems across countries, inadequate transit traffic monitoring and enforcement capabilities by customs administrations, lack of a regional transit guarantee system,² and an ineffective truck sealing system to reduce the diversion of transit goods.³ To monitor and control the movement of transit goods along the corridor, customs administrations have relied on physical escorts for transit trucks. The number of checkpoints along the corridor remains a source of delays and costs for transit traffic. A poor transit system may hamper international trade and national security significantly, and thus hinder the economic development of a country.

The northern corridor links land-linked countries to the Kenyan seaport of Mombasa. Formerly, goods in transit within the region were escorted from the port of Mombasa all the way to Rwanda, South Sudan and DRC borders through Ugandan borders such as Elegu, Oraba, Padea and Goli. It is with this

background that the Electronic Cargo Tracking System (ECTS) was established in Uganda in 2014 and further expanded into a Regional Electronic Cargo Tracking System (RECTS) covering Uganda, Kenya and Rwanda in 2017, with the DRC joining RECTS in 2019.

Table 1: Total transits in Uganda 2014–2018

	2014	2015	2016	2017	2018
Total transits	178,090	195,372	189,618	233,922	285,824
e-monitored	11,459	17,226	15,094	42,845	60,066
% of e-monitored	6.43%	8.82%	7.96%	18.32%	21.02%

Source: URA databases

Table 1 shows an increase in the e-monitored cargo from 6.43 per cent in 2014 to 21.02 per cent in 2018. The RECTS process starts when a customs officer attaches an electronic seal (e-seal) or ultra-sub-sensors on a transit goods container and activates the seal in the system. Upon arrival at its destination without any violations, a customs officer deactivates the seal. The tracking of transit cargo is a crucial customs enforcement practice to monitor and enforce pre-scheduled rules and generate precise information about the position of transit goods at all times. Dysfunctional custom transit procedures increase transportation costs and constitute a major obstacle to international trade.

4.2 Methodology

This study looked at 40 different transits from Malaba to Kampala over 220 kilometres. The transits included transits with e-seals, transits escorted by physical security and transits with normal seals. The different transit times were used to analyse the differences among the three group means in a sample so as to determine the influence of using AI in the management of Uganda's transit system.

The analysis of variance (ANOVA) is based on the law of total variance, where the observed variance in a particular variable is partitioned into components attributable to different sources of variation.

4.3 Findings

Table 2 shows the average transit time for the normal seals to be 12.10 hours and the average transit time for e-seal transits to be 8.7 hours over the same distance. The average transit time for escorted transits is 12.4 hours. The average transit time for e-seal transits is lower mainly because these transits are monitored using AI in real time from the time of departure to the time of arrival and therefore with no unnecessary stopovers, such as interventions by mobile rapid response teams. The average transit time for escorted transits is higher because these transits are at a driver's convenience, which is one form of inefficiency because the longer a truck spends in transit, the higher the transportation costs a trader is charged. Sometimes escorted trucks are also delayed while waiting for the physical escorts who may be unavailable.

Table 2: Transit times

	N	Mean (hours)	Standard Deviation	Standard Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
Normal seal transit	16	12.1044	1.76266	.44067	11.1651	13.0436
e-seal transit	13	8.6923	.96993	.26901	8.1062	9.2784
Escorted transit	11	12.4182	1.51249	.45603	11.4021	13.4343
Total	40	11.0818	2.21517	.35025	10.3733	11.7902

Source: URA databases

The results presented in Table 2 are further supported by the results of Table 3, which shows a P value of less than 0.05, meaning that there is a significant difference between the different average transit times of the three different transit categories.

Table 3: Analysis of variance of different transit times

	Sum of squares	df	Mean square	F	P value
Between groups	110.601	2	55.301	25.333	.000
Within groups	80.770	37	2.183		
Total	191.372	39			

Source: URA databases. df, degrees of freedom. F, F value.

Table 4 uses the Tukey’s HSD test and, based on the results presented in Table 3, the Tukey’s test shows that there is a significant difference particularly in average transit times of e-seal transits that utilise AI compared to other transits at a 5 per cent level of significance.

Table 4: Multiple comparisons of the different transit times

(I) Type	(J) Type	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Normal seal transit	e-seal transit	3.41207*	.55169	.000	2.0651	4.7590
	Escorted transit	-.31381	.57870	.851	-1.7267	1.0991
e-seal transit	Normal seal Transit	-3.41207*	.55169	.000	-4.7590	-2.0651
	Escorted transit	-3.72587*	.60529	.000	-5.2037	-2.2481
Escorted transit	Normal seal Transit	.31381	.57870	.851	-1.0991	1.7267
	e-seal transit	3.72587*	.60529	.000	2.2481	5.2037

Source: URA databases *The mean difference is significant at the 0.05 level

The results are further supplemented by the findings of TradeMark East Africa (TradeMark East Africa, n.d.), which reported that transporters lose USD \$200–\$250 each day a truck spends while in transit which tends to increase the cost of transport for cargo destined further inland, such as Rwanda.

RECTS has minimised the need for physical escorts that previously increased transit periods from one day to three or four days, effectively resulting in an estimated increase in transport costs of about USD \$400–\$500. RECTS has also cut the time required to transport cargo from entry border points (Kenya's Malaba and Busia in Uganda) from six days to one and a half days, subsequently pushing down transport costs (TradeMark East Africa, n.d.).

The report confirms that RECTS has reduced the cost of doing business in Rwanda through improved cargo predictability and increased truck turnaround time, which ultimately leads to lower transport costs. Transport delays and cargo theft are among key concerns for importers and exporters and, with improved security of cargo, importers expect a reduction in transit risks as well as insurance premiums.

In conclusion, RECTS has improved the effectiveness and efficiency of transit management in Uganda because e-sealed transit cargo can be accounted for and traced hence potential cases of diversion or round tripping of goods are detected in real time, hence deterring dumping. It has also enhanced cargo security, which has reduced losses for the business community thereby improving the reputation of Customs.

5. Conclusion

Several challenges need to be addressed to introduce AI. These include factors such as change management over anticipated job loss, skills gap and shortage of AI researchers, capital investment in AI research, AI legislation and limited infrastructure—to name just a few. These challenges need to be addressed by both industry and customs administrations to unlock the significant benefits AI offers.

To achieve this, it is recommended that a Private Public Partnerships (PPP) plan be established for financing coverage infrastructure of RECTS from a few sensitive items in transit to a full roll-out of RECTS on all transit items into and through Uganda. This should be encouraged and further strengthened to increase cargo security along the northern corridor. In this regard, successful AI innovation depends on the creation of PPP connections, links between interested parties, the market, AI end users and AI research experts.

There is also a need to integrate RECTS with other customs systems like Asycuda to inform selectivity risk criteria during the processing of customs declarations. For example, in terms of diversion detection, cargo must be rerouted to the red lane for 100 per cent verification. As a region using RECTS, we should have an ambition of integrating with other smart cargo monitoring systems like Arviem, a cargo monitoring solution that creates real-time supply chain visibility from the port of loading in the country of export to the point of destination.

For other administrations intending to implement AI, a clear change management strategy should be developed by customs administrations, with a detailed action plan, including priorities, timelines, tasks, structures, behaviours, and resources to identify what has changed and what has stayed the same. This will enable staff to appreciate AI-powered solutions as enhancers to their tasks and roles rather than a potential cause of job loss.

Additionally, the WCO should spearhead the accreditation of AI experts in Customs since, despite the fast growth of AI technology, few countries—including developed countries—have the education and skills systems in place to equip their workers to reap the benefits. This will facilitate innovation among customs administrations and facilitate the development of Customs AI-powered solutions.

The WCO should also spearhead the creation of regional AI laboratories to create an enabling environment for development and adoption of AI research in Customs, which will promote Customs AI-powered solutions.

Finally, customs administrations must work co-operatively—as stipulated in the WCO SAFE Framework of Standards—with common and accepted standards to maximise facilitation of the international trade supply chain. When customs administrations are able to work together, it makes joint AI projects like RECTS in Kenya, Uganda, Rwanda and DRC possible, which has made it possible to secure a lengthy supply chain corridor between the different countries. In this regard, co-operation among customs administrations enables them to learn from each other, and benchmark and adopt best practices for AI-powered solutions as a replacement for manual processes.

References

- Access Partnership. (n.d.). *Artificial intelligence for Africa: An opportunity for growth, development, and democratisation*. https://www.up.ac.za/media/shared/7/ZP_Files/ai-for-africa.zp165664.pdf
- AI Forum of New Zealand. (2018). *Artificial intelligence: Shaping a future New Zealand*. <https://www.mbie.govt.nz/dmsdocument/5754-artificial-intelligence-shaping-a-future-new-zealand-pdf>
- Davenport, T. (2020, March 27). *Return on artificial intelligence: The challenge and the opportunity*. Forbes.com. <https://www.forbes.com/sites/tomdavenport/2020/03/27/return-on-artificial-intelligence-the-challenge-and-the-opportunity/#4783b0906f7c>
- DiploFoundation. (2019). *Mapping the challenges and opportunities of artificial intelligence for the conduct of diplomacy*. Geneva: DiploFoundation. <https://www.diplomacy.edu/sites/default/files/AI-diplo-report.pdf>
- Etzioni, E., & Etzioni, O. (2017). Should artificial intelligence be regulated? *Issues in Science and Technology*, 33(4), 32–36. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2993506
- European Commission (EC). (2019). *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Building trust in human-centric artificial intelligence*. Brussels: EC. <https://ec.europa.eu/transparency/regdoc/rep/1/2019/EN/COM-2019-168-F1-EN-MAIN-PART-1.PDF>
- European Union. (EU) (2019). *United Kingdom AI strategy report*. Brussels: EU. https://ec.europa.eu/knowledge4policy/node/37933_nl
- Fabian. (2017, September 11). *Challenges and opportunities of investing in artificial intelligence startups*. Medium.com. <https://medium.com/@bootstrappingme/challenges-and-opportunities-of-investing-in-artificial-intelligence-startups-f36889dbb592>
- G20. (2019). *G20 ministerial statement on trade and digital economy*. <https://www.mofa.go.jp/files/000486596.pdf>
- Galbraith, M. (2018, October 5). Don't just tell employees organizational changes are coming — explain why. *Harvard Business Review*. <https://hbr.org/2018/10/dont-just-tell-employees-organizational-changes-are-coming-explain-why>
- Government Offices of Sweden. (2018). *National approach to artificial intelligence*. <https://www.government.se/491fa7f/contentassets/fe2ba005fb49433587574c513a837fac/national-approach-to-artificial-intelligence.pdf>
- Hall, W., & Pesenti, J. (2017). *Growing the artificial intelligence industry in the UK*. Department for Digital, Culture, Media & Sport and Department of Business, Energy & Industrial Strategy. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/652097/Growing_the_artificial_intelligence_industry_in_the_UK.pdf
- Hulko, T. (2018, May 18). Will AI be a bane or boon for global development? *United Nations Development Programme Blog*. <https://www.undp.org/content/undp/en/home/blog/2018/Will-AI-be-a-bane-or-boon-for-global-development.html>
- The Institute of Chartered Accountants in England and Wales (ICAEW). (2019). *Digitalisation of tax: International perspectives*. [https://www.icaew.com/technical/technology/technology-and-the-profession/digitalisation-of-tax-international-perspectives#:~:text=Digitalisation%20of%20tax%3A%20international%20perspectives%20\(2019%20edition\),future%20challenges%20these%20economies%20face.](https://www.icaew.com/technical/technology/technology-and-the-profession/digitalisation-of-tax-international-perspectives#:~:text=Digitalisation%20of%20tax%3A%20international%20perspectives%20(2019%20edition),future%20challenges%20these%20economies%20face.)
- International Telecommunication Union (ITU). (2018, September). *Assessing the economic impact of artificial intelligence*. *ITUTrends: Emerging trends in ICTs*. Issue paper No. 1. Geneva: ITU. https://www.itu.int/dms_pub/itu-s/opb/gen/S-GEN-ISSUEPAPER-2018-1-PDF-E.pdf

- Internet Society. (2017). *Artificial intelligence and machine learning: Policy paper*. https://www.internet-society.org/resources/doc/2017/artificial-intelligence-and-machine-learning-policy-paper/?gclid=Cj0KCQiAs67yBRC7ARIsAF49CdXldZR-VFD4ClhsLbQfJ5DESX0KdQ1h3zjSBRyoYw2FT9fW0GLgrVsaAlxLEALw_wcB
- Nilsson, N. J. (2010). *The quest for artificial intelligence: A history of ideas and achievements*. Cambridge University Press. <https://ai.stanford.edu/~nilsson/QAI/qai.pdf>
- Office of the Privacy Commissioner of Canada. (2017, February 16). *Appearance before the Standing Committee on Access to Information, Privacy and Ethics (ETHI) on the Study of the Personal Information Protection and Electronic Documents Act (PIPEDA)*. https://www.priv.gc.ca/en/opc-actions-and-decisions/advice-to-parliament/2017/parl_20170216/
- Slesar, M. (2019, December 12). Artificial intelligence in business: Meeting the challenges to AI adoption. *Onix Blog*. <https://onix-systems.com/blog/artificial-Intelligence-in-business-meeting-the-challenges-to-ai-adoption>
- Organisation for Economic Co-operation and Development (OECD). (2016). *Integrity in customs: Taking stock of good practices*. Paris: OECD. <https://www.oecd.org/corruption/ethics/G20-integrity-in-customs-taking-stock-of-good-practices.pdf>
- Organisation for Economic Co-operation and Development (OECD). (2019a). *OECD principles on AI*. Paris: OECD. <https://www.oecd.org/going-digital/ai/principles/>
- Organisation for Economic Co-operation and Development (OECD). (2019b). *Recommendation of the Council on Artificial Intelligence*. OECD Legal Instruments. Paris: OECD. <https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0449>
- Polish Business Link (PBLINK). (2018, May 21). *PBLink Blog*. What every business needs to know about AI. <https://www.pblink.co.uk/other/every-business-needs-know-ai/>
- PWC. (2018). *The macroeconomic impact of artificial intelligence*. <https://www.pwc.co.uk/economic-services/assets/macro-economic-impact-of-ai-technical-report-feb-18.pdf>
- Ramosaj, B., Karaxha, H., & Karaxha, H. (2014). Change management and its influence in the business environment. *Iliria International Review*, 4(2), 9–30. <https://iliriapublications.org/index.php/iir/article/view/43>
- Standards Australia. (2019). *Developing standards for artificial intelligence: Hearing Australia's voice*. Discussion Paper, June 2019. [https://www.standards.org.au/getmedia/aeaa5d9e-8911-4536-8c36-76733a3950d1/Artificial-Intelligence-Discussion-Paper-\(004\).pdf.aspx](https://www.standards.org.au/getmedia/aeaa5d9e-8911-4536-8c36-76733a3950d1/Artificial-Intelligence-Discussion-Paper-(004).pdf.aspx)
- The Manufacturer. (2020, February 17). *Barriers to AI uptake among manufacturers revealed*. <https://www.themanufacturer.com/articles/barriers-ai-uptake-among-manufacturers-revealed/>
- TradeMark East Africa (TMEA). (n.d.). *Regional electronic cargo tracking system unveiled*. Nairobi: TMEA. <https://www.trademarka.com/news/regional-electronic-cargo-tracking-system-unveiled/>
- UK Government. (2019, May 21). *Policy paper: AI sector deal*. <https://www.gov.uk/government/publications/artificial-intelligence-sector-deal/ai-sector-deal#key-commitments>
- United Nations Educational, Scientific and Cultural Organization (UNESCO). (2019). *Artificial intelligence in education: Challenges and opportunities for sustainable development*. UNESCO Working Papers on Education Policy 07. Paris: UNESCO. <http://repositorio.minedu.gob.pe/bitstream/handle/MINEDU/6533/Artificial%20intelligence%20in%20education%20challenges%20and%20opportunities%20for%20sustainable%20development.pdf?sequence=1&isAllowed=y>
- Vincent, J. (2017, July 17). Elon Musk says we need to regulate AI before it becomes a danger to humanity. *theverge.com*. <https://www.theverge.com/2017/7/17/15980954/elon-musk-ai-regulation-existential-threat>

World Customs Organization (WCO). (2014). *Transit handbook to establish effective transit schemes for LLDCs*. Brussels: WCO. https://na.eventcloud.com/file_uploads/054a3d043ff3d9ee58dbc5f559bf54fb_ENtransit-handbook-for-upload-en.pdf

World Customs Organization (WCO). (2017). *Transparency and predictability guidelines*. Brussels: WCO. <http://www.wcoomd.org/-/media/wco/public/global/pdf/topics/facilitation/instruments-and-tools/tools/transparency-and-predictability-guidelines/transparency-guidelines.pdf?db=web>

Yasui, T. (2013). Transit facilitation for regional economic integration and competitiveness. *WCO Research Paper no. 28*. <http://www.wcoomd.org/en/topics/research/activities-and-programmes/~media/30EA73887EED41E1A3E774175C7FE097.ashx>

Notes

- 1 The WTO Glossary defines transparency as the ‘Degree to which trade policies and practices, and the process by which they are established, are open and predictable’.
- 2 Decision C/DEC.13/01/03 Establishes a Regional Road Transport and Transit Facilitation Program in Support of Inter-Community Trade and Cross-Border Movements (JBPs, Observatories, ISRT Awareness)
- 3 Resolution No.2 relating to the implementation of the Joint Border Posts Program of ECOWAS and UEMOA member states

Kugonza Julius



Kugonza Julius holds a master’s degree in economic policy and a bachelor’s degree in statistics from Makerere University, Uganda. He is also a trade policy design and negotiation fellow from the University of Adelaide, Australia, as well as a Mo Ibrahim Governance Fellow from SOAS-University of London. Julius has over 10 years’ experience in the public, CSO and private sectors. He currently works with Uganda Revenue Authority as a Customs Data Analyst. He has worked with Uganda Cares-AHF. He is also a part time Senior Research Fellow at Pride Data Solutions. Julius has researched international trade, food security and urbanisation in sub Saharan Africa and presented policy research papers in Italy, South Africa, Rwanda, Ethiopia, Kenya and Zambia.

Mugalula Christabel



Mugalula Christabel is an applied macroeconomist with over a decade of experience. She holds a Bachelor of Arts Degree in economics from Makerere University, Uganda, as well as a Master of Arts in economic policy from the same institution. She is trained in competition assessment and forecasting in telecoms by PURC, University of Florida, USA, as well as pricing for profit and competitive advantage, by the International Telecommunications Union. Christabel currently works with the Uganda Revenue Authority as a Trade Specialist in Uganda Customs. She has previously worked with the Uganda Communications Commission as a Tariffs & Data Officer. She was also part of consultancies such as commercial interconnection negotiations for newly licensed operators in Tanzania, among others.

