5 Digital AfCFTA in incomplete contracts and bleeding trade contexts

*Gbadebo Odularu**

Abstract: Facilitating end-to-end trade digitalisation requires a thorough grasp of blockchain-powered information exchange across borders while fostering interoperability among multiple communities' commercial platforms. From both incomplete contracts and bleeding trade standpoints, this research digs into Africa's participation in continental trade experiments such as the AfCFTA, and how it posits an infinite spectrum of both complicated choices and opportunities. The research concludes that the bleeding phenomenon inherently embedded in Africa's digital trade landscape could be surmounted by deploying more radical trade-tech regulations.

Key words: bleeding free trade agreements; digital platform; Tradetech; blockchain; free trade agreements; regional trade agreements; African Continental Free Trade Agreements; trade facilitation; traceability; UNCITAL; MLETR

1 Introduction and the context

The rapid proliferation of digital platforms and the ubiquitous presence of algorithmic technologies have continued to distance trade from the physical value chain node, thereby intensifying uncompetitive economic practices among African businesses. Furthermore, the COVID-19 pandemic, and its adverse impact on trade, food, and health inequalities, are positing the critical role of digital trade and health laws among African communities. The COVID-19 pandemic has increasing exposed more Africans to endemically pre-existing inequalities, socioeconomic distortions, and political disorders. For instance, in 2013 to 2016 the

* Howard University Department of Economics, Academic Support Building B, Third Floor 2400 Sixth Street, NW Washington DC 20059; gbadeo.odularu@howard.edu.
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Ebola crisis increased civil violence in West Africa by 40 per cent, while an International Monetary Fund (IMF) study on the effect of five pandemics, including Ebola, SARS and Zika, in 133 countries since 2001 shows that these led to a considerable increase in social unrest.[1]

Pandemics influence supply-side economics by adopting labour-saving technology. Consequently, employers prefer to limit the spread of disease, and robots do not fall ill. IMF research looks at a few recent outbreaks of diseases, including Ebola and SARS, and finds that 'pandemic events accelerate robot adoption, especially when the health impact is severe and is associated with a significant economic downturn'.

In Africa where big data, machine learning and artificial intelligence are still in their infancy, they are becoming increasingly crucial in how African trade, health, food, and other systems operate, thereby increasing need to deploy these innovations to drive trade facilitation innovations and other related positive socioeconomic impact. These data-driven insights can influence policy directions and reforms on public well-being as well as trade and economic development. For instance, the COVID-19 pandemic overwhelmingly shows that trade and transport play a strategic role in stemming and fighting the pandemic. As such, open trade in vaccine inputs and capital goods and efficient access to knowledge are crucial to quickly ramp up vaccine production, transportation, and distribution across and within African countries.

According to an International Trade Centre (ITC) survey on SMEs Competitiveness Outlook 2020, more than half of the firms recorded problems accessing production resources such as raw materials and equipment due to lockdowns in other countries. More specifically, these resulted in slower certification processes and salient logistics problems. The spread of COVID-19 has a devastating impact on traditionally managed businesses, leading to a growing level of concern among business owners. This has elicited mixed reactions by African and Global South business owners bordering on clear-cut strategies to protect their businesses in the wake of the COVID-19 pandemic. As of 18 November 2022, the number of confirmed COVID-19 cases in Africa reached 12 693 548, representing approximately 2 per cent of global infections.[2] Given this, South Africa was the most drastically affected country on the African continent, with

1 AG Buseh and others 'The Ebola epidemic in West Africa: Challenges, opportunities, and policy priority areas' (2015) 63 *Nursing Outlook* 30-40,. https://doi.org/10.1016/j.outlook.2014.12.013 (accessed 1 May 2021)

2 Statista (2022), Coronavirus cases by country in Africa 2022 | Statista (accessed 1 May 2022)

more than 1,24 million infections. As the most severely affected country, the South African government has been saddled with the arduous tasks of strengthening businesses in response to the adverse effects of COVID-19 pandemic-related macro-economic shocks.

However, the high costs of transporting physical goods, slow and undependable custom processes, and poor regulatory systems continually undermine Africa's intraregional trade and SMEs' survival. For instance, only 11,2 per cent of African SMEs' quality certifications are internationally recognised, while only 18 per cent of new exporters survive for three years. As such, regulatory policies should be implemented for the removal of these bottlenecks to facilitate cross-border e-commerce, such as the online creation of businesses, international e-payments, cross-border deliveries, aftersales services, and standards and certification.[3],[4] Consequently, enterprises, industries, and countries are investing in digitalisation tools and capacities as strategic priorities. Thus, the multilateral business landscape is gradually evolving into a strengthened network of electronic commerce-related parastatals, driven by a collective vision that rallies its stakeholders towards mobilising technical, digital, and financial resources for global competitiveness, digitalisation, servicification, and economic diversification agendas. As the COVID-19 pandemic evolves and Africa overwhelmingly accesses data via wireless networks, digital platforms have been playing an indispensable role in bringing businesses back better. An extant literature review also shows that digital trade could enhance Africa's socio-economic recovery capacities if it expands consumption, investment, and technological frontiers. For instance, the use of cellular phones for text messaging and mobile money has had tremendous development impacts, even without much broadband internet access. Invariably, access to broadband internet, combined with smartphone ownership, empowers an individual's capacity to use data for a better life, such as connecting with family and friends, accessing government services, online shopping, and reaching educational platforms, thereby tackling digital inequity related community challenges. In addition, social distance and lockdown enforcement policies have resulted in an unprecedented expansion in digital streaming, which includes exercise, shopping, education, video

3 McKinsey & Company 'How the COVID-19 crisis may affect electronic payments in Africa' (2020), https://www.mckinsey.com/~/media/McKinsey/Industries/Financial%20Services/Our%20Insights/How%20the%20COVID%2019%20crisis%20may%20affect%20electronic%20payments%20in%20Africa/How-the-COVID-19-crisis-may-affect-electronic%20payments-in-Africa.pdf (accessed 5 May 2021)

4 International Trade Centre (ITC) 'COVID-19: The great lockdown and its impact on small businesses' (2020) SME Competitiveness Outlook Report, 2020, https://www.intracen.org/SMEOutlook/ (accessed 30 May 2021)

conferencing, and related EdTech/fintech services. There are high-cost implications for government agencies, as enforcers and private operators are required to comply with those regulations.

The increasing attraction of African governments to digital trade, smart trade agreements, digital trade agreements, free trade agreements, digital platform competition, privacy regulations, cybersecurity, and data protection motivate this chapter. We adopt descriptive statistical techniques, qualitative approach as well as doctrinal research to analyse the *status quo* on Africa's continental free trade agreements responsiveness to digital markets contracts, the continental preparedness for data protection and interoperability as the core drivers of the future of trade facilitation innovation.The doctrinal research approach to this study focuses on a review of the relevant literature on the theories and economics of CFTAs.

2 Motivation, problem statement, structure and research methodology

How digital trade and platform technologies have diffused throughout the African economy has been an intensive research arena. In addition, these platforms are increasingly being scrutinized by regulatory authorities such that the past two decades have witnessed how large digital platforms such as Amazon, Facebook, Google, Alibaba, JD, and Tencent have generated extraordinary amounts of revenue by matching users with advertisers, merchants, and content producers, thereby resulting in regulatory interventions like the California Privacy Rights (CPRA), and the European Union's General Data Protection Regulation (GDPR).

Fostering fair competition and overcoming bleeding[5] trade agreements require consumers' access to information about market possibilities in terms of best value and right quality. However, information overload and digital platforms anti-competition practices such as misleading pricing, drip pricing, and unfair contract terms undermine consumers' capacities to gain from trade. More specifically, end-to-end digital trade platforms and the use of TradeTech have the potential to reduce discrimination, while automated systems provide ample opportunities to perpetuate hidden bias. Based on this understanding, if machine learning (ML) algorithms overlook actors' strategic behaviour, policy prescriptions become increasingly incompatible with the original business goal and mission, especially in this digital age, where policy makers and mechanism designers largely deploy ML for decision making. Africa's trade facilitation

5 Bleeding is generated by nonlinear amplification of random socio-economic activities such that the outputs or outcomes do not change linearly.

policy concerns include how to robustify ML algorithms toward reducing inequality on digital platforms. Would nudging transparent behaviour facilitate trade and business on the platform? There currently are many studies that attempt to analyse the impact and predict the future of Africa's spaghetti of national and regional trade agreements. However, one of the recurring trade facilitation hurdles confronting Africa is driving and deriving favourable socio-economic outcomes as the continent 'gradually' invests its resources in digital trade programmes. Given this, this research presents a theoretically nuanced understanding of Africa's effective participation in continental trade facilitation initiatives such as the African Continental Free Trade Area (AfCFTA).

Based on this background, the research sheds some light on the question: How would Africa accelerate its intra-regional trade, while positioning digital trade at the forefront of artificial intelligence (AI) and learning to build an innovative digital trade-driven ecosystem? In providing answers to this question, this chapter introduces digitalisation's 5Ps concept in understanding the infinite opportunities across Africa's invisible borders. The chapter is outlined as follows: Part 1 introduces the chapter, while Part 2 presents the research motivation of the study, the problem statement, the research structure and the methodology. Part 3 expatiates on the micro-economics of contract design under uncertainty and its application to this research. Part 4 focuses on how deep and digitalised the AfCFTA is; part 5 presents the theory of digitalisation and symmetry of increasing free trade agreement (FTA) spaghettis; part 6 conceptualises 'bleeding trade' within a universe of possible FTAs; part 7 presents the relevance of platform economics, trade tech, device economics, and digitalisation 5Ps for enhancing Africa's data protection governance and cross border trade capacities; part 8 demonstrates the connectivity between digital trust, interoperability and equitable trade outcomes for Africa; and part 9 concludes the study with workable and desirable policy recommendations.

3 Micro-economics of contract design under uncertainty: Algorithmic game theory (AGT)

Emily Durkheim (1858-1917), the founder of modern sociology, observed that not everything in a contract is contractual because there are a few matters of interest to the parties, but which cannot be articulated in an enforceable contract.[6] Contracts in this context could be perceived as interest alignment to enable gain exploitation from the cooperation

6 N Mambrol 'The sociology of Emile Durkheim. Literary theory and criticism' (2015), https://literariness.org/2017/05/10/the-sociology-of-emile-durkheim/; and Compensation and Incentives in the Workplace (jstor.org) (accessed 16August 2021).

between two parties whose interests are not the same. One of the long-standing puzzles of trade and business transactions is why simple, suboptimal contracts are ubiquitous.[7] Consequently, the algorithmic lens provides three motivations: (i) it offers a language to analyse contract complexity; (ii) it puts forth alternatives to average-case or Bayesian analysis that emphasise robust solutions to economic design problems; and (iii) the popularisation of the use of approximation guarantees when optimal solutions are inappropriate.

Although algorithm-incentive interactions generate algorithmic mechanism design (AMD) and algorithmic contract design (ACD), this relationship also results in hidden preferences and hidden actions.[8] Contract theory has been at the root of microeconomic theory by attempting to answer a fundamental question – 'how to incentivise people to work' since the 1970s.[9] [10] [11] One of the pillars of the micro-economic theory of contract design answers the question of how to incentivise people to exert efforts.[12] For instance, as trade and e-commerce contracts become increasingly digitalised and grow in scale and complexity, sources of complexity in contract design could be subdivided into (i) multiple agents[13] and (ii) multiple actions.[14]

In a Stackelberg game scenario, a leader plays against a follower. The leader begins by choosing a mixed strategy over their action set, and the follower's best response is to choose the pure strategy that maximises their

7 G Carroll 'Robustness and linear contracts' (2015) 105 *American Economic Review* 536-563 2015 10.1257/aer.20131159 https://www.aeaweb.org/articles?id=10.1257/aer.20131159. According to Carroll, it probably is the great robustness of linear contracts that account for their popularity.

8 N Nisan & A Ronen 'Algorithmic mechanism design' (2001) 35 *Games and Economic Behaviour* 166-196, ISSN 0899-8256, https://doi.org/10.1006/game.1999.0790. (https://www.sciencedirect.com/science/article/pii/S089982569990790X) (accessed 16August 2021).

9 J Laffont & D Martimort *The theory of incentives: The Principal-Agent Model* (2002).

10 P Bolton & M Dewatripont *Contract theory* (2005).

11 B Salanie *The economics of contracts: A primer* (2005).

12 Although pioneered by Kenneth Arrow as one of the pillars of economic theories in the 1960s, contract theory was driven by Oliver Hart and Bengt R Holmstrom; the 2016 Nobel Memorial Prize in Economic Science was awarded to Oliver Hart and Bengt Holmstrom for their work in contract theory – developing a framework to understand agreements such as insurance contracts, employer-employee relationships, and property rights.

13 Y Emek & M Feldman 'Computing optimal contracts in combinatorial agencies' (2012) 452 *Theoretical Computer Science* 56-74.

14 P Dütting and others 'Combinatorial contracts' (2021). In Proc. IEEE FOCS 2021. 815-826.

utility. If the leader optimally chooses their mixed strategy, this results in a Stackelberg equilibrium of this game.[15] [16] [17]

How does contract design relate to the Stackelberg game? Contract design is a general Stackelberg game where the principal is the leader (their action is choosing a contract) while the agent is the follower. Technically, computing Stackelberg equilibrium in a Bayesian game requires reducing this to computing the optimal single contract in a principal-agent setting with types. Some insightful generalisations of contract design to Stackelberg games are evident in monopsonies such as labour unions or single-payer health care. As such, how should a monopsonistic buyer set prices and design mechanisms to buy possibly multidimensional goods from several sellers? In the same vein, how should a monopolistic seller set prices and design mechanisms to sell possibly multidimensional goods to several buyers?

It is not surprising that an increasing number of classic applications of the Stackelberg game and incomplete contracts are evident in Africa's online marketplaces[18] (digital platforms, e-commerce platforms, crowdsourcing platforms, freelancing websites, platforms for hiring specialists, supply chains, marketing, and other insurance). Based on the classic contract theory that modern and increasingly digitalised economies are held together by innumerable contracts,[19] this research takes an example from a simple contract setting in which the Jumia platform provides digital crowdsourcing e-commerce space for agents to provide their goods for sale, thereby promoting the e-commerce website. Thus, the agent acts, and the principal pays. The defining feature of this example is that the agent's actions are not directly observable and are characterised by limited liability. Other examples are freelancing platforms, where a task is outsourced to a freelancer, and a massive online course website, where

15 Conitzer 'On Stackelberg mixed strategies' (2016) stackelbergSYNTHESE.pdf (duke.edu) (accessed 16August 2021).

16 V Conitzer & T Sandholm 'Computing the optimal strategy to commit to' in Proceedings of the 7th ACM Conference on Economics and Computation (EC) (2006) 82-90.

17 A Blum and others 'Computing Stackelberg equilibria of large general-sum games' in D Fotakis & E Markakis (eds) *Algorithmic game theory. SAGT 2019. lecture notes in computer science* (2019), https://doi.org/10.1007/978-3-030-30473-7_12 (accessed 16August 2021).

18 For more issues on unfair trade among online marketplaces, see Ch 1 of this book – GO Odularu & C Checkwoti *Digital platforms, unfair trade, and computational competition* (2023).

19 The 2016 Nobel Prize Announcement states that 'modern economies are held together by innumerable contracts' – Laureates Oliver Hart and Bengt Holmstrom.

students get to learn. In both cases, an algorithmic approach is usefully applicable and timely based on early proofs of concepts on (Teams)[20] [21] and (crowd sourcing).[22] If we consider a contract setting with uncertain distributions and known expectations, $R_1, \ldots, R_n$, a linear contract *maximises* the expected revenue in the worst-case over distributions compatible with $R_1, \ldots, R_n$. Thus, when a case is doubtful, opting for a design agnostic to the unknown details is advisable. Due to incomplete contract settings and high transaction costs, not all specific investments appear in contracts, leading to underinvestment and calling for socially beneficial policy, which is a renegotiation of trade contracts.[23]

In the case of Jumia, as one of Africa's foremost digital crowdsourcing e-commerce hubs, it accepts commodities from agents to attract customers. Two defining features of such a contract (within and across national borders) include (i) agents' actions are hidden – moral hazard; and (ii) principal never charges (only pays) agent – limited liability.

4 Blockchain and trade: How deep, digitalised, and interoperable is AfCFTA?

Before 2020, digitalisation[24] and artificial intelligence were already well applied to selected sectors of the African economy, and it is projected that by 2040 digitalisation can transform Africa's job markets if public policies work for all.[25] As African countries experience increasing urbanisation and socio-economic transformation in the face of inadequate digital technologies and state fragilities, digitalisation accelerates more rapidly than the world average; the progress of digitalisation in African regions differs across national and subregional economies. More specifically,

20 M Babaioff and others 'Dynamic pricing with limited supply' (2015) 3 *ACM Trans on Economics and Computation* 4.

21 M Babaioff, M Feldman & N Nisan 'Combinatorial agency' in *7th ACM Conf on Electronic Commerce (EC)* (2006).

22 C Ho, A Slivkins & JW Vaughan 'Adaptive contract design for crowdsourcing markets: Bandit algorithms for repeated principal-agent problems' (2016) 55 *Journal of Artificial Intelligence Research* 317-359.

23 RH Coase 'The nature of the firm' (1937) 4 *Economica* 386-405, https://doi.org/10.1111/j.1468-0335.1937.tb00002.x (accessed 16August 2021).Of course, there are equilibria windows within Coasian dynamics if players or actors are patient.

24 According to the National Bureau of Economic Research (NBER) 2023 Summer Lecture, digitalisation and artificial intelligence increasingly cover the same topics, such as platforms, privacy, discrimination, bias, jobs opportunities, inequality, copywright, intellectual property, surveillance, etc.

25 AUC/OECD Africa's Development Dynamics Digital Transformation for Quality Jobs (2021). AUC, Addis Ababa/OECD Publishing, Paris, https://doi.org/10.1787/0a5c9314-en. (accessed 16 August 2021).

the digital gap between high and low-income African countries shows distinctly sharp differences when digitalisation is measured in the context of ICT accessibility and ICT utilisation indicators published by the International Telecommunication Union (ITU). The gap in mobile phone subscriptions between high and low-income African countries between 2000 and 2020 has decreased, while the number of internet servers (a good measurement of digitalisation) has widened between the two groups from 2010 to 2020.[26] Consequently, the degree of maximising digitalisation opportunities could be measured with the Networked Readiness Index of the World Economic Forum (WEF), which shows Africa's intercountry digital gap by income group in terms of the quality of ICT infrastructure utilisation and enterprises' ICT usage.[27] By implication, digitally leading countries focus on basic and applied research and talent attraction, while digital latecomer economies focus on public sector reform and infrastructure creation.[28] [29] [30] Promoting digitalisation policies and strategies across industries and sectors will enhance trade, investments, and socioeconomic transformation. Although there are inter and intracountry discrepancies, there are strong incentives to foster digitalisation to enhance trade tech interoperability, trade facilitation innovation, and economic competitiveness.

Blockchain is a distributed ledger (digital) technology that portends profound risks-mitigating impacts on trade. Blockchain and DLT bring immutability of information, thereby increasing the likelihood of trusted data. Blockchain and digitalisation in its entire sphere of sustainable development influence radically as it reshapes the delivery of trade tech and fintech services and gained tremendous momentum during the coronavirus era. In addition to fostering financial inclusion by facilitating trade and remittance flows, blockchain technology is accelerating access

26 For more discussion on how African countries' digital entrepreneurship indicators, see ch 7 of this book.

27 World Economic Forum 'Enabling trade: Valuing growth opportunities' (2013), http://reports.weforum.org/global-enabling-trade-2013 (accessed 21 February 2022).

28 KIEP 'The digital economy in Southeast and South Asia: Towards mutually beneficial cooperation with Korea' (2020) KIEP Opinion 177 - The Digital Economy in Southeast and South Asia: Towards Mutually Beneficial Cooperation with Korea | KIEP Opinions | Publications: Korea Institute for International Economic Policy.

29 JG Kim and others 'Digital platform markets of ASEAN and India: Implications for cooperation with Korea' (2021) KEIP World Economic Brief (WEB) 21-33 - Digital Platform Markets of ASEAN and India: Implications for Cooperation with Korea | World Economy Brief | Publications: Korea Institute for International Economic Policy (kiep.go.kr)

30 KY Lee 'New rules for the digital economy and multilateral cooperation' (2020) KIEP Opinion 182 - New rules for the digital economy and multilateral cooperation | KIEP Opinions | Publications: Korea Institute for International Economic Policy.

to financial commodities for the unbankable by making financial services cheaper, safer, and more transparent, as it gives control over identities and privacy. As the internet revolutionised the spread of information, digitalisation is radically reshaping the current and future of trade, financial services, and entrepreneurial opportunities, especially in the era of the COVID-19 pandemic.

Despite the rapid explosion of digital platforms and markets in Africa, trade facilitation and competition measures are critical to ensuring that African firms can participate effectively in digital-enabled trade. This fast-growing internet and digital economy include new economic activities driven by ICTs, big data, AI, blockchain technology, internet economics, and digital economics towards informing consumer behaviour, firm dynamics, and government supervision in a digital space. These digital platforms are expanding in the post-coronavirus African trade landscape, especially in five sectors (fintech, entertainment, e-commerce, education and health care).

(AfCFTA) is the world's largest global free trade area by country participation. The signing of the AfCFTA represents a turning point that happened due to some previously initiated FTAs in Africa. An interesting approach is to assess the before-and-after explanation of the AfCFTA from a positive or negative bleeding perspective. In other words, are the AfCFTA objectives desirable? What are the critical assumptions required before the AfCFTA vision is achieved, and if there are side effects? Furthermore, does a more efficient approach to realising AfCFTA objectives exist? In our world of spawning complexities and dynamics, all dots have dots of their own in the sense that unless one counts God, there is no uncaused cause.

AfCFTA's objectives include (i) consolidating Africa's continental trade area; (ii) removing tariffs on 90 per cent of commodities exported within Africa; (iii) fostering economic integration; (iv) generating sustainable jobs for African youths; and (v) driving Africa's industrialisation trajectory. The AfCFTA was launched as a model of cross-border cooperation in the middle of COVID-19, trade protectionism, national isolationism, health systems collapse, food insecurity, and increasing global digitalisation. Despite its vast potential to foster growth, raise welfare and stimulate industrialisation, most smaller and vulnerable countries are concerned that they could suffer revenue losses and other adverse effects from premature or bleeding trade policy with an inadequate emphasis on labour, competition investment, and intellectual property.

It is relevant to note that Africa is gradually ramping up national and regional efforts to harmonise regulations for the continentally integrated digital economy: Southern African countries have created a few regional initiatives to facilitate digital trade, transformation, and market access.[31] [32] For instance, the Digital SADC 2027 provides the overarching framework for regional digitalisation, with a critical focus on infrastructure, coherent ICT regulatory framework, and industrial development. See Table 1 for examples of SADC's digital economic initiatives.

Table 1: Examples of regional digital economic initiatives

	Initiative	**Years**	**Description**
1	Digital SADC 2027	2012 – 2027	THE 2012 SADC Regional Infrastructure Development Master Plan's ICT pillar is aimed at universal, harmonised broadband frequencies, fibre-optic backbone infrastructure, spectrum allocation, harmonised ICT regulatory framework, centers of excellence.
2	Analog to Digital Migration	2009 – Present	Technical support to member states in meeting analog-to-digital migration
3	SSA Model Laws	2008 – 13	The Communications Regulatory Authority of Southern Africa (CRASA) drive and implements innovative strategies to reduce roaming costs in the region.
4	Declaration on Information and Communication Technologies	2001-Present	SADC ICT policy, highlighting infrastructure and regulation.
5	Rwanda – Smart Africa Alliance		A pan-African initiative endorsed by all African heads of state to accelerate socioeconomic development in Africa through ICTs

31 International Trade Centre (n 4) .

32 McKinsey & Company (n 3).

6	Next Einstein Forum (NEF) Rwanda and Kenya	2018 and 2020, respectively	NEF works to make Africa a global tech hub, placing youth at the center based on four projects: Global Gatherings, Policy Institute, NEF Community of Scientists, and NEF platform.
7	Mauritius – African Network Information Center		Serves as the Regional Internet Registry for Africa and is responsible for distributing and managing several internet resources
8	Kenya – Microsoft's Africa Development Centre	2019	Microsoft launched its Africa Development Centre in Nairobi, with USD 100 million in infrastructure and the employment of local engineers over the first five years of operations.

Source: AUC/OECD 2021, Africa's Development Dynamics 2021: Digital Transformation for Quality Jobs, AUC, Addis Ababa/OECD Publishing, Paris, https://doi.org/10.1787/0a5c9314-en

The Common Market for Eastern and Southern Africa (COMESA) aims to develop a digital free trade area (DFTA) as a digital platform that enables duty-free and quota-free trading, thereby providing a regional market worth US $17,2 billion.

South Africa, Kenya and Nigeria are among the leading digital platform countries in Africa, and their digital policies leverage digitalisation and the role of AI across all sectors to bring the continental economy back better.[33] [34] [35] [36] [37] Perhaps the litmus test of the AfCFTA in the post-

33 G Odularu 'The primer: Bracing Nigerian trading ecosystem for the future' in G Odularu (ed) *Strategic policy options for bracing Nigeria for the future of trade* (2020).

34 G Odularu 'Conclusion and policy recommendations' in Odularu (n 31).

35 G Odularu 'Digital pathways for fostering post-COVID-19' (2020c), https://www.afronomicslaw.org/2020/07/18/digital-pathways-for-fostering-post-covid-19-trade-outcomes/?fbclid=IwAR2FOS9d9U6epp8ItvrqhRlJkfmevHPblTuPmdaXRqt0ed9X12oYEH6U5Fk (accessed 16 August 2021).

36 G Odularu 'Building businesses back better amid COVID-19 pandemic in Africa' (2020) in 'Crisis and fragility: Economic impact of COVID-19 and policy responses' KIEP Visiting Scholars' Opinion Paper Visiting Scholars' Research Activities | KIEP Visiting Scholars Program | ETC: Korea Institute for International Economic Policy.

37 G Odularu & P Alege 'Trade facilitation capacity needs' (2019) Palgrave Pivot, Cham. https://link.springer.com/book/10.1007/978-3-030-05946-0 (accessed 16 August 2021)

pandemic world will be how much supply chains, trade facilitation, and digital trade can systemically create or originate, drive and lead (CDL).

Regarding the digitalisation of financial services, and the creation of its central bank digital currency (CBDC), increasing number of African countries are keenly interested in NFTs, especially South Africa, which is among the top ten countries by NFT users in 2021. Furthermore, bitcoin made its way to the national treasure and was declared legal tender in the Central African Republic due to new regulations. The cybersecurity market is proliferating and is predicted to expand further in the next decade to the alarming rate of money laundering and financial cybercrime.

From a telecommunications and media standpoint, mobile gaming represents nearly 50 per cent of today's gaming market. Gaming is one of the most exciting media segments, and the number of gamers today currently outnumbers the addition of European and African populations. With the rapidly growing African youth population, and explosion in smartphone usage, it has become so easy to engage in the cloud and mobile gaming for everyone, thereby firing youth participation in immersive gaming.

As Africa's trade strategies focus on tourism, financial services, and telecommunications, other pertinent trade in services (TiS) areas, its economic trajectory include (digital) broadcasting; e-learning; online retailing; air transport; hotel services; gaming; software (entertainment); information services; and digital health. For instance, Africans purchase consumables online from Alibaba or Amazon are part of TiS; or when Africans provide content on globally popular entertainment or social media platforms such as YouTube and Instagram.

5 Theoretical peeps into the symmetry of increasing FTA spaghettis

The dynamic effects of FTAs could be classified into three categories: (i) economies of scale due to access to a larger market, thereby allowing producers to become more efficient through greater specialisation, better equipment, and usage of byproducts; (ii) greater competition such that increased number of producers make collusion less likely and forces firms to become more efficient; and (iii) stimulus of investment because of an increased rate of return and ability to spread research and development costs, thereby making more significant levels of investment more likely. First, it is important to define FTAs, RTAs, and PTAs, as presented in Table 2.

Table 2: FTA, TAA, and RTA Definitions

RTA	Regional Trade Agreement (RTA) refers to an agreement between two or more countries to apply lower trade policy barriers to goods and services imported from the members than to those imported from third countries. Modern RTAs deploy increasingly complex intra-trade regulations such as standards, safeguard provisions, customs administration, etc.., and provide preferential regulatory framework for mutual services trade rules on investment, competition, digitalisation, environment, and labour.
PTA	Preferential Trade Arrangements (PTAs) are unilateral trade preferences such as Generalised System of Preferences (GSP) schemes, nonreciprocal preferential schemes for products from Least Developed Countries (LDCs) only, as well as other nonreciprocal schemes that have been granted a waiver by the General Council (such as AGOA or CARIBCAN).
FTA	Free Trade Area refers to a PTA for which barriers on trade between members are reduced or eliminated and may include use of discriminatory trade preferences. FTA members may impose a common external tariff (CET) for each product, a CET may be imposed with or without the continued use of internal customs controls.
CM	A Common Market (CM) is the deepest form of economic integration which allows the free movement of productive factors (labour and capital) as well as products (goods and services).
CU	A Custom Union (CU) is an FTA with a CET, in which internal customs controls have been eliminated, so that goods imported from third countries may circulate freely throughout the territory of the customs union.

Source: UDLAP, (2001)[38]

Africa currently comprises a mixture of different, unique and smaller RTAs and FTAs being implemented over a period. From an analytical perspective, the symmetry of deploying an increasing number of FTAs may imply fewer strategically combined opportunities. Imagine that Africa would like to manage six FTAs jointly or continentally, but it only has the socio-economic capacity to manage four successfully. By implication, this creates 15 possible FTA choices for the continent. If the continent expands its socio-economic possibilities frontiers due to the discovery and adoption of modern technologies, it turns out that the continental economy can only successfully manage five FTAs. This

38 UDLAP (2001), https://www.udlap.mx/in.tradeagreements/docs/SecoundSection/Second%20Section%20-%20Trade%20Agreements%20A%20Typology%20-%2001.pdf (accessed 16 August 2022)

automatically creates six possible FTA choices for the continent. What if the socio-economic capacities trajectory enlarges to contain its expected six FTAs? In many ways, policy experts can choose six FTAs out of six FTAs. Only one, which means picking all the FTAs, which appears to be the current situation that Africa finds itself with the increasing spaghetti bowls of RTAs and FTAs. Therefore, picking more FTAs offers Africa fewer possible FTA opportunities, especially as the global economy has yet to recover from the COVID-19 epidemic.

Reconstructing this analogy implies that instead of African governments interested in which new FTAs to implement (since implementation percentages have not been significantly impressive for most of the FTAs), Africa should instead focus on which of the existing FTAs to discontinue. Therefore, strategically implementing four FTAs out of six invariably is the same as choosing two FTAs left behind. Both cases will provide Africa with 15 possible FTA choices. The same analogy applies to implementing five FTAs out of six or choosing an FTA that will be left unimplemented, creating six possible FTA choices.

At this juncture, there are three main insightful inferences.

(1) The more FTA choices Africa makes, the harder it becomes to keep track of the previous FTA choices it has made.
(2) In other words, the more FTA choices that are made, the fewer FTA choices that are omitted.
(3) More intuitively, if Africa chooses 'X' many FTAs in as many ways as it picks 'Y' minus 'X' many FTAs, this is the same as omitting ('Y'-'X') many FTA choices.

For further explanation, inferences (1) and (2) are valid and necessary in general. In other words, the first inference states a reason why symmetry can be a valuable tool for African decision makers in this FTA context. The second inference reveals why African policy makers would like to apply symmetry logic in policy-making processes as the AfCFTA implementation unfolds. However, both first and second inferences are not sufficient reasons behind the symmetry of FTA choices. The third inference focuses on the symmetrical nature of FTA pathways concerning choices' similarities with forgone FTA opportunities.

This shows that the number of possible 'X' FTA choices is symmetric concerning 'Y' over 2. Furthermore, if

$$X > \frac{Y}{2}, then, (Y-2) > (X) X > \frac{Y}{2}, then, (Y-2) > (X)$$

applying symmetry to grasp a full understanding of the dynamics in the FTA landscape.

The African continent and its national governments are currently being confronted with a bouquet of regional and international FTA and RTA choices. Thus, it is relevant to ask how the digitalisation of trade relates to the symmetrical aspects of FTA choices for African governments. Furthermore, how long will it take every African government to explore every possible FTA in the menu strategically? To solve these questions, and in addition to honing its trade negotiation skills, the African government needs to have complete knowledge of the contents and far-reaching socio-economic implications of every FTA deal. For most African countries, socio-economic capacities are not strong enough to benefit maximally from these FTAs. However, digitalisation could be explored to enhance Africa's preparedness capacities for the future of FTAs and RTAs. A strategic way of tackling this dilemma is to think of the different parts of the FTA bouquet as separate entities profoundly and reflectively. For instance, the Democratic Republic of the Congo (DRC)'s national trade strategy comprises three global, regional, and national levels.

Furthermore, each TA position has different parts: an international TA with five aspects, a continental RTA with four parts, and a national trade agreement with three aspects. There are ways of choosing the best TA options for each of the three positions, thereby generating a different number of possible choices by simply multiplying all three TA options together. Invariably, five international RTAs times four continental RTAs times three national trade agreements equal 60 different and distinct TAs for DRC. In this digital age, it is prudent for DRC to explore several versions of TAs before deciding which version is the best. This is crucial for DRC because it shows the decisionmakers how many different RTA possibilities exist, despite the seemingly limited possibilities for every TA. Furthermore, it helps trade policy makers determine the appropriate amount of time it would take for individual TAs to be successfully implemented and completed. This implies a dire need for African policymakers to remove several of these TA options to tremendously decrease the investment of resources (human, financial, infrastructure, and so forth) that could have been allocated to a more socio-economically impactful and low-hanging community development fruit.

6 Conceptualising bleedingness within a universe of implementable FTAs

At this juncture, a good understanding of 'bleeding' will provide a firm conceptual grasp of the epistemic characteristics of African trade systems and the role of technology in its increasingly digitalised trade space. What is the mechanism that generates a 'bleeding phenomenon'? What are the implications? Moreover, would it be possible to mitigate the impacts of a bleeding trade? Answers to these and similar questions are presented in this sub-section.

Economics remains one of the most distinct disciplines in social sciences largely because most or all agents are assumed to have stable, well-defined preferences and make rational choices consistent with those preferences in markets that (eventually) clear. Rationality, being an economics theory assumption, rather than a demonstrated fact. According to Thaler, 'markets do not always operate with the trap-like efficiency we impute in them'.[39] Bleeding could result in African countries becoming trapped in a socio-economic quagmire, therefore resulting in trade without gain. However, a trader's bleed cannot occur if all trading actors are rational, so evidence of a trader's bleed in market setting would constitute an anomaly.

At the most basic level, bleeding is generated by nonlinear amplification of random socio-economic activities such that the outputs or outcomes do not change linearly. Instead, it depends on the derivate, and the relationship between the variables is convex rather than linear – the more convex the curve, the more amplification the random outcomes. By implication, convexity is the primary mechanism that generates bleeding. According to Taleb, convexities result in serious socio-economic fragilities.[40] This justifies the need to understand bleeding within the 'epistemic' context of leveraging it to predict selected variables and human behaviour based on the four forecasting quadrants posited by Nassim Taleb.[41] [42] [43] The forecasting potential of statistics is limited when research

39 RH Thaler 'Anomalies: The winner's curse' (1988) 2 *Journal of Economic Perspectives* 191-202.

40 NN Taleb *Fooled by randomness: The hidden role of chance in life and the markets* (2004) 24.

41 As above.

42 NN Taleb *The black swan: The impact of the highly improbable* (2007).

43 NN Taleb 'The fourth quadrant: A map of the limits of statistics' unpublished manuscript (2008), http://www.edge.org/3rd_culture/taleb08/taleb08_index.html (accessed 16 August 2022)

questions fall into the world of uncertainty with complex outcomes and unknown population distribution parameters in the tails.[44] When writing this chapter in 2020, the global trade and economic systems were on the brink of an economic recession mainly due to the pandemic. While a few economies are emerging unscathed, we believe that most other economies are experiencing bleeding due to the inadequate capacities of states to navigate tumultuous times.

Furthermore, bleeding trade could be understood from a post-trade agreement (TA) perspective. For instance, post-Brexit the UK still imports more from outside the European Union (EU) than within the bloc's single market, which it left in January 2021. These facts and historical information predict the present and explain why FTAs turn out the way they did. It might seem like a simple matter of observing and connecting the dots, but the challenge is that most of the time, the dots also have too many dots, thereby predicting the success of an FTA as nearly as difficult as predicting the future.

From an insightful angle, FTAs are seemingly great games in which the players are controlled by the random outcomes of a complex and dynamic system. It is a game that requires parties or countries to leverage their scientific inventions and discoveries across all sectors – health, manufacturing, agriculture, services, education, etc. However, no trade policy expert or organisation can connect all the dots due to the universe of dots in the global trade space because much other randomness occurs. Nevertheless, if these FTAs were not or had not been initiated, then the trade policy and negotiations landscape would or would not be as existentially dynamic as we know. For instance, making African countries agri-food transformation consistent with World Trade Organisation (WTO) standards requires a comprehensive overview of the agricultural sector perceived within the WTO and the Agreement on Agriculture and its pillars. There are quite a few approaches of agglomerating and critically assessing previous FTAs and endowing them with collective meaning understanding within the AfCFTA perspective. This helps to attach handles to the past FTAs while placing a spin on them as one connects them from the AfCFTA, thereby enhancing trade policy coherence towards community advancement and based on the assumption that AfCFTA implementation would turn on a singularly phenomenal socio-economic transformation for Africa.

44 NN Taleb & A Pilpel 'On the unfortunate problem of the no observability of the probability distribution' unpublished manuscript (2004), http://www.fooledbyrandomness.com/knowledge.pdf (accessed 16 August 2022)

Based on this background, Africa is on the cusp of FTA transformation in its approach, design, and implementation of trade policy and practice. If one gambles with the Ghanaian Cedis to win a succession of pesewas or risks a succession of pesewas to win Ghanaian Cedis?[45] In most economic decisions, there exists overwhelming evidence of the popularity of the first, a case of *fat tailor* leftward skew of return variability. In terms of Africa's century-old FTA experience, the number of its RTAs is increasing over time. There is a far more sizable decline in commodities prices in which Africa trades and exports to the rest of the world than would be expected by FTAs. For instance, the increasing dependence on a narrow range of export commodities has doubled the susceptibility of the Nigerian economy to shocks such as the COVID-19 pandemic. The Nigerian Budget Office forecasts an approximately 80 per cent reduction in government revenue due to the impact of the COVID-19 crisis.[46] More importantly, the fact has always remained that Africa's exports are significantly impacted as the economies of the buyer nations stagnate from the pandemic-related economic activities slowdown. NEPC shows the impact of the pandemic on agricultural exports – cocoa, sesame, and cashew – accounting for over 70 per cent of Nigeria's foreign earnings from agricultural exports in 2020.[47] Furthermore, African governments have made frantic efforts to diversify and enhance their export capacities. For instance, some of these interventions include export incentives, the creation of export processing zones, special economic zones, infrastructure development facilities, and numerous agency-based development initiatives in collaboration with development partners.

Nevertheless, most countries and regions tend to overlook the likelihood of these falling returns, especially if the trends in the negative changes are seemingly insignificant over a long period. The trade returns for most of these countries are such that when price shocks occur, trade returns are high, and vice versa, such that these trading countries have poor long-term memories in addition to lacking future risk discounting capacity. Thus, the fear of infrequent significant losses makes countries enamored with small, short-term trade gains. Of course, global trade regulatory organisations are aware of this, and they implement tools and instruments to foster the possibility of occasional significant gains. However, the asymmetrical

45 Taleb (n 40).

46 'Nigeria&#39 oil revenue falls by 80 per cent' *Africa News* (7 May 2020), https://www.africanews.com/2020/05/06/nigeria-s-oil-revenue-falls-by-80-percent/ (accessed 16 August 2022)

47 NEPC Impact Assessment and Policy Responses to the Coronavirus Pandemic on Agricultural Exports. Nigeria Export Promotion Council, (2020) (9 April 2020), https://nepc.gov.ng/cms/wp-content/uploads/2020/04/Covid-19-impact-assessment.pdf (accessed 19 August 2021)

insight is that some FTAs invest so much but receive meagre returns on this investment. The simulation studies for most of the FTAs, like the case of the AfCFTA, reveal ample evidence of socio-economic benefits to the poor and to the respective governments. However, most of the documents are significantly negatively skewed. Would African countries facing these scenarios of stochastic returns prefer negative skewness? Based on Africa's historical experience with FTAs and related trade agreements, would Africa prefer to 'bleed' (that is, undergo small but frequent losses) or 'blow up' (that is, take severe hits concentrated in short periods? In most cases, African countries and regions manage their trade returns to strategically manage more negative returns because global trade is lopsided towards the Global South, which is naturally uncompetitive primarily due to its insufficient trade-related knowledge and infrastructural deficit. Over time, Africa has been absorbing the pain of steady losses of FTAs, thereby seemingly bleeding its way to trade and economic collapse, which could be averted via blockchain-powered trade facilitation digitalisation.[48]

Responding to the advantage of these small gains from FTAs, regardless of occasional disastrous trade returns, it is advisable to adopt Nassim Taleb's argument on the randomness of returns, which may eventually result in *catastrophe trading*. Sustainable structures need to be mainstreamed in the AfCFTA to prevent Africa's economy from its increasing level of bleedingness. This requires Africa to further foresight for a long time, with potential annual trade losses, as well as the knowledge that one day, possibly several years down the road, their FTAs leadership's patience will pay off handsomely. However, the global trading system needs to be reregulated to make more African countries absorb the capacity to implement this strategy. Moreover, the implementation of such a strategy in the face of a significantly untapped export potential is critical due to Africa's innate biases against losses. Consequently, one of the options available to Africa is taking the purposefully painful but preparatory steps towards an unimaginable post-COVID-19 future of trade.

These heavy downturns are mostly driven by the contraction of 4,3 per cent and 8,0 per cent of Nigerian and South African economies, respectively. In addition to the adverse impact of the pandemic on SSA oil exporters such as Angola and Nigeria, other commodity exporters are being confronted by severe contractions. The combined impact of the global economic slowdown, the sharp decline in commodity prices, and

48 J Lim 'How digitalisation averted cross-border trade disaster in Asia - Tech Wire Asia' (2021), https://techwireasia.com/2021/07/how-digitalization-averted-cross-border-trade-disaster-in-asia/ (accessed 5 September 2021).

the rising costs of managing the COVID-19 outbreak pose debilitating shocks on African economies.

Expected asymmetric payoffs (E (P)):

(1) E(P) < 0; this is a disadvantageous FTA that should not be negotiated to avoid bleeding unless the country desires risk and bank on bleeding FTA.
(2) E(P) = 0; here is a fair deal in which the payoff is just right such that the amount invested equals the same expected streams of returns.
(3) E(P) > 0; here is a favourable FTA deal in which the country expects streams of bountiful returns in the future.

7 Harnessing platforms, tradetech, device economics and digitalisation's 5Ps

African countries, mainly low-income countries, remain underrepresented in digital trade talks, except Burkina Faso, which has joined the Joint Statement on Electronic Commerce discussions on rules for digital trade under the WTO, compared with 52 high-income countries. This non-inclusive nature of representation undermines the potential rules under discussion and risks, resulting in a one-size-fits-all approach due to the lack of voice of low-income countries in which their digital trade issues may remain untreated. Such issues may include difficulty applying rules that require heavy investment in regulatory institutions or are costly for MSMEs and the need for capacity building and technical assistance.

Digital-tech driven platforms are increasingly becoming the trading hub that improves users' market access, thereby shaping business models, transforming industries, influencing strategies, and enhancing states' effectiveness and capacities to deliver public policies efficiently. They also provide users with various social and technical boundary resources, such as application programming interfaces (APIs) that provide access to data, software development kits, and various templates and considerably lower usage costs. In addition, as the number of apps in mobile application markets increases, more innovative protocols are needed for platforms that significantly foster interoperability. For instance, technology platforms are new governments, and content moderation is the new law as private sector powers expand in our societies.[49] In the same vein, trade tech platforms such as Amazon, eBay and Alibaba enable domestic, national, and global trade as these platforms increasingly transform into innovative, automated

49 H Bloch-Wehba 'Content moderation as surveillance' (2022) 36 *Berkeley Technology Law Journal* (forthcoming), ttps://ssrn.com/abstract=3872915 (accessed 16 August 2022)

mechanisms for enforcing rules. However, public authorities will exert influence over platform content rules, thereby providing a louder voice to governments and leveraging social media platforms to detect, investigate, and prevent crime. For instance, mobile trade tech services and digital apps make access and outreach of trade facilitation beyond the confines of brick-and-mortar buildings – government and private sector physical offices. Trade facilitation-related applications provide users with 24-hour access to trade opportunities and personal trade facilitation delivery experience.

From a socio-economic reality viewpoint, a successful platform must attract and connect a combination of users, customers, service or product providers, advertisers, and other actors, who collectively form the platform's ecosystem. Furthermore, super apps are 'all-in-one' apps that offer users a range of functions, such as groceries, shopping, messaging, banking, ride-hailing, dietary guides, health awareness suggestions, and so forth. Super applications also remove the impediments undermining users' willingness to make intelligent decisions, as well as providing nontraditional banking insights and behavioural nudges to customers – for instance, combining strengths with Google to offer businesses with insights and technology needed to succeed, taking advantage of app promotion and engagement tools such as Google's App Campaigns, and collaborating with mobile measurement firms such as AppsFlyer to drive customer value as well as improve users' experience.

Thus, cross-platform applications exist when consumers, firms, and businesses use applications that operate on various platforms from different developers. For instance, if we have a duo-sided trade facilitation mobile cross-platform applications model that considers application manufacturers and intermediaries (platform producers and mobile operators), on the one hand, and consumers of the services via these applications, on the other. More specifically, the model comprises consumers who simultaneously subscribe to certain trade tech operators on the other hand, content providers who enter into agreements with platform manufacturers to obtain application development tools and mobile operators to ensure the operability of developed applications and, finally, the platform-software in which applications can be used.

An increasing number of platforms are focusing on developing more consumer-centric approaches. Given this, there is an increasing need for data and knowledge sharing between platforms and regulators to enhance regulators' awareness of consumer behaviour, desires, and expectations to inform public policies and regulatory systems that enhance consumers' trust in digital trade platforms. A blockchain-technology-supported platform

provides a higher value for customers than traditional platforms, thereby revealing the 'Matthew effect'[50] caused by the network effect that platform advantage (from adopting blockchain technology) or disadvantage (from not adopting blockchain technology) accumulates over time.[51]

As the speed and complexity of businesses accelerate in this digital age, entrepreneurial agility and flexibility depend on how fintech and trade tech platforms are deployed to maximise data availability.[52] This portends huge potential to completely transform how millions of people access finance, trade, and transact business. It is not surprising that the big five US tech giant companies – Google, Amazon, Facebook, Apple, and Microsoft (GAFAM) – experienced 27 percent net sales growth to $113 billion in the second quarter of 2021, partly offsetting a slowdown in its core e-commerce business with robust expansion in its cloud and advertising segments. By implication, the entire GAFAM group and e-commerce behemoth continue to profit from the pandemic's stimulating effect on online advertising, e-commerce, and consumer spending.

In China, Alipay and WeChat Pay have changed the nature of retail consumption and the future of trade facilitation. In addition, social media platforms and apps are increasingly crucial instruments for trade, entrepreneurship, commerce, and governance.[53] First, it is essential to note that not all data or information has the same value in the sense that an enterprise's 'crown jewels' are well worthwhile. This trade secret theft has resulted in corporate 'bring your device' policies. [54] [55]

50 'Matthew effect' basically is how advantages beget further advantages. From a sociological perspective, it is the cumulative advantage in which the rich get richer while losers keep losing if a regulatory framework is not implemented by the government. The explosive production and adoption of social media, with its good and bad sides, have enhanced cumulative implications of the 'Matthew effect'.

51 L Zhang & S Chen 'China's digital economy: Opportunities and risks' (2019) IMF Working Paper WP/19/16.

52 Z Kapron 'From digital payments to digital finance: How China's tech companies are redefining banking in Asia and soon Europe' (2018) 12 *Journal of Payments Strategy and Systems* 68-73, From digital payments to digital finance: How China's tech ...: Ingenta Connect (accessed 16 August 2021)

53 KLX Wong & AS Dobson 'We are just data: Exploring China's social credit system concerning digital platform rating cultures in Westernised democracies' (2019) 4 *Global Media and China* 220-232.

54 Economic Intelligence Unit (EIU) 'Open secrets? Guarding value in the intangible economy' (2021) The Economist Intelligence Unit.

55 A Haide 'Open secrets? Guarding value in the intangible economy' (2021) The Economist Intelligence Unit.

The economics of devices have accelerated the applicability and utilisation of digital platforms such that Amazon's broad consumer electronics products aimed at enhancing customers' delight include Kindle, Ring, Echo, Fire TV, Fire Tablet, and aero devices. These products or devices meet customers' diverse needs, such as entertainment, Alexa audio assistants, home security and WIFI access, and connections from multiple devices and supplemental subscription services. These trends result in increasing complexity of consumer electronics product portfolios and, at the same time, serve as impactful tools for improving operational productivities, pursuing innovative business models, elevating customer experiences, enhancing organisational efficiencies, and driving profitability, especially for micro, small and medium enterprises (MSMEs). However, digitalisation could extenuate the digital divide, such as 'winner-takes-all markets', for three reasons: (i) peculiar challenges confronting under resourced communities in accessing digital devices as well as internet services (with considerable bandwidth); (ii) political and socio-economic divides such that social media platforms such as Twitter, Facebook, Instagram, and so forth, are becoming increasingly more influential than national governments; (iii) inequity and inequalities between the haves and have-nots are perpetuated in a vicious circle through the use of digital platforms.[56]

Digitalisation's multidimensional and interdisciplinary space cuts across socio-economic, environmental, diplomatic, geopolitical, and communal boundaries. Digitalisation provides a collaborative platform for sharing, accessing, and sustaining over a million unique and robust trade tools, information, collections, experiences, and opportunities from a digital trade viewpoint. Digitalisation provides a unique trade ecosystem, and trade facilitation apps represent an intuitive interface that allows traders to easily access thousands of tools. Digitalisation also provides the space for exploring the usage and uniquely curating their favorite tools into personalised galleries, thereby promoting and sustaining digital trade research, education, knowledge, methods, innovations, models, learning, practice, partnerships, opportunities, and impact. [57] [58] The critical and interrelated digitalisation five Ps that would prepare Africa for the future of trade facilitation innovations are conceptualised in Figure 1.0.

56 B Adekunle & C Kajumba 'The nexus between Instagram and digital entrepreneurship' (2020) 21 *Journal of African Development* pp 14-40.

57 Lim (n 46).

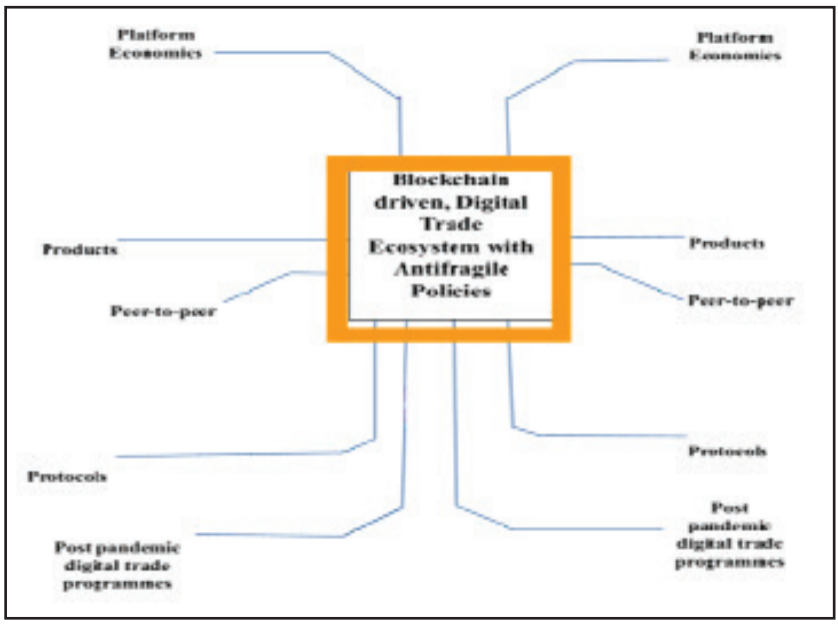
58 GOA Odularu & B Adekunle 'Digitalisation in the African context' (2021) 21 *Journal of African Development* pp 1-13.

Africa's smart and digital trade ecosystem's preparedness should depend on:

(1) Platform economics which leverages big data technologies and artificial intelligence to accelerate the inclusiveness and sustainability of digitalisation;
(2) Products and services (digital or electronic) through e-commerce platforms, cross-border e-commerce apps continually experience increasing engagements. Some of these engagements are recorded via online learning, e-communication, and news awareness social media platforms (Facebook, WhatsApp, WeChat).
(3) Peer-to-peer process to foster and enhance trust via blockchain technology. Connecting and interoperating differently through blockchain technology.
(4) Protocols provide security for access to blockchain technology security, decentralisation, scalability, reliability, usability, maturity, and governance.
(5) Post-pandemic safety net programs and policies (laws and regulations) to respond to both the number of users and the time spent online, mobile social networking, medical services, short video, and mobile games.

Trust, transparency, and fairness in all their pervasiveness are critical in today's trade, food, and health platforms, including manufacturing, trade, distribution, access, and other nodes of vaccine value or supply chain. In Africa's regional trade space, and when AfCFTA was introduced, fewer and more than half of the countries on the continent were reluctant to join. Astonishingly, the most significant economies – South Africa, Nigeria, Tanzania, and so forth – were skeptical and did not believe in AfCFTA partly due to trust issues. Consequently, and as shown in Figure 1, the 5Ps would constantly integrate trust, authenticity, and blockchain-enabled regulatory elements in trade, health, and food risk management policies, practices, tools, and frameworks in a legally agreeable manner. In addition, trade and industry ministries at the national levels should proactively implement rules for markets surrounding digital platforms, the challenges they face, and the dramatic rates at which these platforms are being transformed. The 5Ps would be beneficially impactful to trade expansion if there is an enforceable act on trust-enabled digital platforms (ATEDP).

Figure 1: The 5 Ps of Africa's digital trade ecosystem's preparedness



Source: Author's Design

Platforms and privacy protection will enhance the capacities of digital trade to foster sustainable development, driving equal opportunities, equal rules, and equal rights towards realising digitalisation potentials for Africa. This requires strict legislation and a rigorous understanding of local dynamics. Every variable should be incorporated into the dynamics of *in situ* analysis (prediction is difficult). Sustainable trade programmes should leverage digital platforms from partners in the industry, the public sector, and workable policies to collaborate.

More importantly, the 5Ps inform how Africa could strategically enhance its preparedness towards radically reshaping the quality of (digital) trade facilitation in the face of globally bleeding trade ecosystems and stark socio-economic inequalities. In more specific terms, Africa's trade facilitation preparedness will be driven by platform economics (digital) products, peer-to-peer processes, protocols, and post pandemic safety net programmes and policies (laws or regulations). As demand for digital commodities[59] remains high during and in the post-pandemic

59 Commodities such as online medical care, remote medical inquiry, online diagnosis, remote working in the healthcare industry, sports/fitness apps (as well as indoor fitness equipment purchase trend, online learning, e-communication adoption on health,

era, digitalisation's 5Ps could represent a bouquet of programmes for underserved households and small businesses via open-source, democratised, and decentralised blockchain-based tools.

Although some curious users could uncover even more innovative tools on mobile applications, there is an increasing need to create more awareness and educate underserved communities on navigating the apps for their maximum benefits. As digital trade facilitation space evolves, women-owned and other minority businesses should be supported in deploying mobile apps as lamplighters in the entrepreneurial ecosystem to help them navigate their paths more confidently and profitably in the 'dark' terrain they operate.

8 Digital-trusted networks, TradeTech, trace-ability, and interoperability: How to foster equitable trade outcomes within the AfCFTA

No technological innovations in the twenty-first century seem to surpass mobile applications and the rapidly evolving digital landscape, which comprises e-commerce, the online sharing economy, platforms, and other activities generated through them.[60] [61] It is driven by digital technologies such as the internet, mobile connectivity, cloud computing, big data, machine learning, artificial intelligence (AI), blockchain, Internet of Things (IoT), robotics, smart manufacturing, predictive and data analytics, and other new digital technologies.[62] [63]. For instance, if ICT production, digital technology, and other digital inputs are fused into its entire industries, the Chinese digital economy is estimated to account for approximately 30 per cent of its overall gross domestic product (GDP).[64] Digitisation has resulted in a drastic reduction in transaction costs – search costs, replication costs, communications costs, tracking costs, and verification costs – coupled with the restructuring of the supply of digital commodities in creative industries such as movies, music, and television. Another variant of digitalisation is digital currencies in digital form, which are primarily

finance (or business) news awareness channels via social media platforms (Facebook, WhatsApp, WeChat), safety consciousness (laundry sanitiser, antiseptic hand sanitisers, disinfectants, yoga mat sales, ventilators, and other health-related products), online recreation, etc.

60 IMF 'Measuring the digital economy (2018) 28 February Staff Report.

61 KIEP (n 26).

62 S Pedro 'COVID-19 pandemic: Shifting digital transformation to a high-speed gear' (2020) 37 *Information Systems Management* 260-266.

63 Odularu & Adekunle (n 56).

64 Zhang & Chen (n 49).

managed, stored and exchanged on digital computer systems, especially over the internet. Types of digital currencies are electronic currency, virtual currency, and cryptocurrencies. It is relevant to note that digital currency is a new, innovative, and crucial type of infrastructure economy related to a country's occupancy in the global economy. This infrastructure comprises the certification center, the management module, the big data analysis centre, and so forth. The relationship between sovereign digital currency and digital payment platforms is evident if we take digital RMB as an example. WeChat and Alipay are the financial infrastructures that serve as the wallet, while the digital RMB is the payment tool, which is the wallet's content. The economics of platforms and the rapid expansion in app development are primarily linked to how the platform provides have drastically lowered the costs of development and distribution over time.

In a peculiar food delivery space,[65] it would be rational for delivery platforms to operate without riders and drivers but rather adopt autonomous delivery vehicles, including drones, in response to how staff costs expand as platforms expand. Every percentage increase in autonomous food deliveries through drones or other devices could result in a slightly more than a percentage increase in company-side earnings and could cut delivery times. Keeping all sides of platforms happy is key to keeping the network effect flywheel going.

Based on the OECD's 'Roadmap Toward a Common Framework for Measuring the Digital Economy', digitalisation comprises four major scopes: (i) core scope, which focuses on the ICT sector and includes economic activities from producers of digital content, ICT goods, and services; (ii) narrow scope, which includes all emerging economic activities that are solely driven by digital technologies. It expands beyond ICT to include other elements such as business-offshoring processing, information technology outsourcing, and other activities in the gig economy (click-work, Upwork, platform economy (such as Airbnb, Uber, eBay, Alibaba, and so forth); (iii) broad scope covers all economic activities significantly enhanced by digital technologies; e-business (ICT-enabled business transactions, such as mobile money and other financial technologies) and its subsets, e-commerce, e-delivery services, use of digitally automated technologies across all economic sectors; and (iv) digital society extends beyond the three previous scopes to incorporate digitalised interactions and activities excluded from the GDP production

65 The top global food delivery platforms are Deliveroo, Delivery Hero, Door Dash, Swiggy, Uber Eats, Just Eat, Zomato, etc.

boundary, that is, zero priced digital services such as the use of public digital platforms.[66] [67] [68] [69] [70] [71]

According to the WTO, while traceability is ensured by an application of DNA markers, a public, permissionless, Ethereum blockchain, which allows for the running of smart contract, is used to increase trustworthiness of data as well as the connectivity, cost-efficiency, scalability, and transferability of the solution. Subsequently, the transfer of data from existing systems will be allowed through an application programming interface (API). Traceability and interoperability among supply chain stakeholders using global data standards foster trade facilitation. Interoperability is the result of business processes, systems, applications, and standards to identify, capture, and share. Supply chain collaboration thrives on standardisation; product traceability needs interoperability across the supply chain; to achieve interoperability, traceability systems need standards; and without standards, product traceability is complicated, expensive, and inaccurate. Standards, traceability, and blockchain technology are used here to enhance MSMEs' capacities to trade themselves out of poverty. Real-time shipment traceability data are integrated into inspection and quarantine systems while using commodity barcodes and batch numbers to foster cross-border trade, and African consumers are ready to pay a higher price for traceability.

The COVID-19 pandemic increased data traffic and heralded greater use of online platforms. The three leading platforms reported approximately 700 million daily users in March to April 2020, amounting to approximately one-tenth of the world's population. Zoom's average number of users jumped from 10 million in December 2019 to 300 million in April 2020; Cisco's WebEx recorded 324 million users in March 2020, doubling from January 2020; and Microsoft Teams had 75 million daily users in April 2020 (World Development Report, 2021). In other words, being homebound resulted in more use of online purchases, social media, video streaming, and online gaming and, therefore, generated massive

66 AUC/OECD, Africa's Development Dynamics Digital Transformation for Quality Jobs, (2021). AUC, Addis Ababa/OECD Publishing, Paris, https://doi.org/10.1787/0a5c9314-en (accessed 16 August 2021)

67 Odularu (n 31).

68 Odularu (n 32).

69 Odularu (n 33).

70 Odularu (n 34).

71 G Odularu, B Adetunji & A Odularu 'Conclusion and policy recommendations: Creating an enabling business ecosystem for fostering trade opportunities in the digital age' in G Odularu, M Hassan & M Babatunde (eds) *Fostering trade in Africa. Advances in African economic, social and political development* (2020) pp 213 - 218.

expansion in data traffic. When shelter at home was implemented across countries, German videoconferencing traffic on DE-CIX rose by 50 per cent, and gaming and social media traffic increased by 25 per cent.[72] However, the usage expansion has its digital divide dark side in which many people around the world have been excluded from online learning, telehealth, and social media platforms because they lack broadband access and computers, thereby underscoring the importance of excluded users.

Science and technology have been critical to the improvement of global trade and public well-being. For instance, TradeTech represents a set of technologies that enables global trade to become more efficient, inclusive and sustainable. It also plays a crucial role in easing the flow of goods across borders, thereby reducing trade costs and redefining the future of trade opportunities. As technology reshapes trade flows faster than trade rules and policies, Tradetech deploys technology, innovation, and software to support and digitally transform and modernise trade finance. Remarkably, as digital technology advances, so are global capabilities to extract valuable insights while building trust, privacy, and security into digital products and solutions. In the last decade, which is driven by the internet and data science, the rise of digital technology resulted in trillion megabytes of data being produced daily, thereby providing many opportunities to utilise this immense amount of data to derive insights and drive change. However, from a legal dimension, the potential benefits of big data and its scientific application come with the ethical stewardship of information and the trust that our clients and collaborators have in us to protect and secure their data from a personal privacy rights perspective. Thus, the fragilities across industries and geographical borders often result in unintentionally inequitable outcomes while hindering the pursuit of equity. In response to these challenges, ITFA, DNI, ENIGIO, DLT Ledgers, IMDA Trade Trust, and ICC digital standards initiatives with Minehub, TradeWaltz, and Tradelens implement new modern approaches that leverage unique properties of blockchain to digitise, decentralise, and foster trusted and interoperable trade and supply chains. Africa needs to accelerate the learning and adoption of these new approaches to enable industry, government, trade techs, fintech, and communities to deploy blockchains to produce value.

Harnessing the value of interactive data, combining the benefits of global standards, and blockchain technology efficiently solves businesses' trust, transparency, and security challenges. Extracting actionable knowledge from business network data enables businesses to efficiently

72 World Development Report Data for Better Lives (2021) World Development Report 2021: Data for Better Lives (worldbank.org)(accessed 16 August 2021)

build collaborative networks. This requires automating data exchange and securing supply systems with robust cryptography, blockchain technology, and decentralised networks and applying advanced AI and machine learning to power trade intelligence with actionable, noise-free data. A good example is the Navigation and Geocoding Technologies (Naveo) platform, which is used by over 300 corporate clients in Africa and the Indian Ocean region to track fleets by capturing its GPS locations, fuel tank levels, speed and engine status, among other sensitive vehicle-related information.

For instance, the digitalisation of the agri-food sector could be facilitated by deploying innovative tools, digital technologies (such as distributed ledger technologies (DLTs) and blockchain protocols), and intelligent solutions along the supply chains. While the role of data exchange between stakeholders cannot be overestimated in driving sustainable food systems, transparency and trust are crucial for well-performing and sustainable agri-food supply chains. However, in many food supply chains, both are lacking. Fostering trust in agri-food supply chains could be well understood by implementing blockchain technology to integrate data from supply chain actors, and relevant stakeholders can improve the traceability of commodities. For instance, an act on improving transparency in digital platforms towards ensuring that origin trial protocols are integrated into complex supply chains and enhancing deeper insights into the specificities of agri-food sectors and their users – including farmers, food producers and consumers. Thus, key stakeholders' data along the supply chain are integrated and verified to address the lack of interoperability, thereby creating an environment that provides additional value for the entire agri-food system, focusing on the traceability of products and their authenticity. Thermal sensors are installed on ships and vehicles to monitor refrigerators transporting foodstuffs and medicines to alert them to any sudden rise in temperature. By implementing and utilising origin trial protocols into complex supply chains proves the flexibility of their solution while at the same time gathering more profound insights into the specificities of agri-food sectors, as they mine data along food supply chains, from farms and distributors to markets, such as the condition of vehicles, fuel consumption, behaviour of drivers and road route optimisation recommendations.

To enhance traceability and foster transferable documents in electronic form towards accelerating e-commerce, digitising transferable documents is an essential but not sufficient step in trade digitalisation. The sufficient condition necessitates the functional recognition of electronic transferable documents as equivale to paper documents when trading nations engage in cross-border trade. In this regard, UNCITRAL adopted in 2017 the Model

Law on Electronic Transferable Records (MLETR)[73] as a technology-neutral method for (i) the singularity principle: identifying the electronic record as the electronic transferable record so that multiple claims of the performance of an obligation indicated in this record would be avoided; (ii) rendering that the electronic record is capable of the being subject to control from its creation until it ceases to have any effect or validity; and (iii) retaining the integrity of the electronic record. Thus, for AfCFTA member countries to seamlessly exchange electronic data and documents in a digital space, all information needs to be clearly articulated.

8.1 Adapting the UNECE blockchain pilot for fostering traceability and due diligence: The C-4 case study

Some of the problems confronting the Cotton 4 (C-4) countries could be four-pronged: (i) creation of an enabling environment for engagement and collaboration of all upstream and downstream cotton value chain actors; (ii) lack of open source and inclusive capacity-building solutions for scaling micro and small medium enterprises in the cotton value chain, (iii) how to enhance identification and coding of key data toward assessing the sustainability performances of cotton processes, facilities and products; and (iv) lack of tailored policy interventions and ethical regulations that reference standards for cotton data interoperability and considering other evolving technologies such as AI, IoT, big data, and cloud computing.

Traceability, transparency, and due diligence in the African cotton industry are crucial for enhancing the environmental footprint and social impacts resulting from decades of unsustainable consumption and production practices. For instance, in 2020 UNECE launched a pilot project to develop a blockchain system for traceability and due diligence in the cotton value chain, thereby providing governments and enterprises with a set of tools to advance traceability, transparency and sustainability in this industry. Some of the set of sustainability indicators being traced include origin, content (organic and recycled), use of chemicals, compliance with due diligence requirements, products and materials (traceability assets), sustainability certificates, inspection reports, and business partners (shipping documents, delivery notes, invoices, and so forth).

73 Samples of countries and frameworks that have adopted MLETR include Kingdom of Bahrain, Singapore, Abu Dhabi Global Market, Law Commission of England and Wales, TradeTrust, Engigio, Fox***

9 Conclusion: Digital trade facilitation, United Nations Commission on International Trade Law (UNCITAL) Model Law on Electronic Transferable Records (MLETR), and overcoming a bleeding CFTA

One of the recurring trade facilitation hurdles confronting Africa is the digital infrastructure gaps across markets which are stubbornly resistant to legal interventions, especially in this digital age, where data flow deals, agreements, and regulations are at the heart of trade facilitation. As Africa's digital economy aims at widening trade facilitation and economic gains, product safety, public security, market competition, practical legislative tools, and regulatory policies must be deployed to fast-track global digitalisation. Preparing Africa to become a resilient and digitally-strong economy requires tightening regulatory frameworks, implementing anti-monopoly policies, and adopting industry-specific data security legislative instruments. These devices or smartphones, their apps, and their inbuilt Bluetooth, GPS, certification, traceability, cameras, and tech capabilities played strategic roles in constantly transmitting COVID-19-related information, improving traceability, fostering remote diagnosis and curbing the spread of the pandemic. For instance, in East Asia, where smartphones are ubiquitous and privacy sensitivity is trivial, smartphones were deployed to monitor household and community compliance with quarantine measures, lockdown requirements, exposure to infected people, and vaccination enforcement. More specifically, it was more expedient for China to create software to provide every individual with a personal scannable QR code that would reveal virus status, its nearly 100 per cent smartphone population and penetration, and ubiquitous OR codes. Thus, the adoption of contract-tracing and quarantine-monitoring apps was mandatory in China and South Korea, despite their different socio-economic and geopolitical systems, while digital tracing was not enforced in the US, resulting in minimal adoption. Similarly, smartphone techs have been deployed in other developed countries but in a much narrower sense due to privacy concerns.

To overcome bleedingness and AfCFTA needs such strategic-sector traceability initiatives: (i) block-verify and blockpharma, which help to fight counterfeit in pharmaceuticals; (ii) agridigital and agriledger, which help agricultural businesses to solve supply chain inefficiencies and track the origin of their products; (iii) Cardano, working with small winemakers to enable end-to-end supply chain traceability for organic wines; provenance, which asserts the sustainable provenance of foods, drinks, beauty and fashion; (iv) Minehub and minespider, which deploys

blockchain for traceability and responsibility mining and mineral supply chains; (v) ever ledge tracks the movement of diamonds from mines to shores.

It is pertinent to state that AfCFTA would avoid a bleeding trade phenomenon if it implements the United Nations Commission on International Trade Law (UNCITAL) Model Law on Electronic Transferable Records (MLETR)[74] as a basis towards achieving regulatory convergence on the continent. AfCFTA will realise its vision if it increasingly implements electronic transactions and documents (such as e-signatures, trust services, electronic transferable records, and e-contracts) and to coordinate regulatory approaches on emerging issues such as tokenisation while avoiding a regulatory framework. In a similar vein, the International Institute for the Unification of Private Law (UNIDROIT) Digital Assets and Private Law Project develops international standards to enable jurisdictions to take a common approach to level issues arising from the holding, transfer, use and the taking of security over digital assets. This UNIDROIT Project adopts a neutral approach while accommodating diverse types of assets and technologies, together with various legal cultures.

Even though digital platforms offer huge opportunities for MSMEs to access markets and development sales channels, it is pertinent to note that factors such as network effects and low marginal costs may transform digital platforms into monopolies and oligopolies. Thus, even though digital economy-related legislative and regulatory reforms in Africa have not been as rapid and advanced as those in the US, China and the UK, selected African countries are gradually catching up despite the rising digital divide between urban and rural areas. In view of this, an act on trust-enabled digital platforms (ATEDP) should be promulgated, enforced, and based on digital platform guidelines for measures to facilitate mutual understanding with platform users. These guidelines should stipulate: (i) direction of desirable measures; (ii) specific reference measures that specified digital platform providers should take to facilitate mutual understanding with their customers; in view of this, the ATEDP should (i) designate digital platform providers to disclose terms and conditions and other information, secure fairness in operating digital platforms, submit a yearly report on business operations performance, and self-

74 UNCITRAL MLEC and the United Nations Convention on the Use of Electronic Communications in International Contracts (Electronic Communications Convention) provides a standard approach to the legal validity of enforceability of contracts formed by the exchange of data messages. Or e-contracts or by the interaction of automated systems (or electronic agents) without human involvement (that is, automated or algorithmic contracts).

assessment; (ii) require the ministry[75] to review the business operations of the platform based on yearly reports and other information with the involvement of business users, consumers, academics, and so forth; and (iii) the government should encourage digital platform providers and their customers to facilitate mutual understanding.

Moreover, Africa's two significant efforts in creating a regional data protection regime are the African Union Convention on Cyber Security and Personal Data and article 15 of the AfCFTA. The AfCFTA Protocol on Trade in Services was modelled on the WTO's General Agreement on Trade in Services (GATS) article 15 (C)ii of Protocol on Trade in Services, which provides the following: privacy of individuals concerning the processing and dissemination of personal data and the protection on confidentiality of individual records and accounts. In addition, the AUC on Cyber Security and Personal Data Protection this convention is a comprehensive document covering electronic transactions, privacy, and cybersecurity (Malabo Convention) 2014. Furthermore, AfCFTA should incorporate specific data protection provisions to maintain international best practices in data protection. This would ensure that (i) Africa remains competitive in international trade, thereby increasing the number of member states and external trade partners; (ii) safe conduct is maintained during transactions involving personal data exchange; (iii) there are clear-cut data protection standards, ensuring that data flows within control and alongside rights.

As the African trade facilitation ecosystem evolves, its increasing number of public and private-driven platforms, such as trade finance, transportation or national single windows (NSWs) follow different rules and often operate in isolation. Thus, more efforts are required towards collaborative cross-jurisdictional and trans-sectional approaches while enabling continental flows of electronic data and documents.

Increasing understanding of data governance, laws, processes, and regulations (especially in Europe) requires that digital platform producers address many legal pathologies attributable to our seemingly opaque global trade, health and food systems. The realisation of this challenge as well as the structural, regulatory, and ethical instruments to overcome them are taking shape as digitalisation 5Ps are being intensively deployed to avoid a negative bleeding trade. However, the asymmetry

75 The government should develop systems and procedures for securing fairness, for settling and resolving complaints and disputes; appointment of administrators to manage communication within and outside the country, and other measures necessary for taking customers situations into consideration.

is seemingly deepening Africa's socio-economic susceptibilities. This asymmetry implies that Africa's trade capacities require an interplay between structural reforms, regulatory instruments, and platform actors (owners, users, designers, and so forth) and an epistemic openness to facts, opinions, figures, statements, and data. It is pertinent to note that Big FinTech's (BFT) Regulatory frameworks and regulatory 5Ps' initiatives provide digital financial services faster and more affordable.[76] They also create some risks to financial systems because of platform economics and tendencies towards market concentration and dominance, data misuse, and existing regulatory standards gaps. Thus, African policy makers should craft more customised digital technology, trade, and finance-related regulatory policies to foster sustainable trade and socio-economic development. For the future of AfCFTA, the sooner AfCFTA signatories align their regulatory approaches with new TradeTech applications, such as tokenisation or smart contracts based on autonomous systems, the greater the continent's digital trade regulatory anti-fragility.

In addition, the new digital economy rules (WTO e-commerce, BEPS, and so forth) call for multilateral cooperation and coordination rather than strategically balancing fairness and trade equity in a globally comprehensive manner. While less disruptive but rather transformed in this fourth industrial revolution and at this stage of the digitalisation transition, Africa's national digital trade and taxation rules should be sensitive to the needs of vulnerable populations and minority business variables such as gender, consumers, MSMEs, and digitalisation-latercomer countries. Its more minor distortionary nature will enable MSMEs to reap full benefits and leverage it to leapfrog to greater levels.[77] [78]

However, as the digital age deepens in the post pandemic world, Africa's national and regional governments should deploy more effective legislative and regulatory frameworks to make digital entrepreneurship and SMEs' participation in e-commerce platforms more competitive. In other words, monopoly control over data and scale affects gains distribution between firms operating on e-platforms. Calligaris, Criscuolo, and Marcolin (2018) show how digital sector firms in 26 OECD countries enjoy disproportionate market power and profitability such that firms

76 A Sergeev, AW Douglas & C Kuzi 'Policymakers, big FinTech's and the United Nations Sustainable Development Goals' (2021) The Dialogue on Global Digital Finance Governance Paper Series, Technical Paper 3.1, 2021, University of Hong Kong Faculty of Law Research Paper 2021/30, http://dx.doi.org/10.2139/ssrn.3870612 (accessed 21 August 2021).

77 International Trade Centre (n 4).

78 McKinsey & Company (n 3).

operating in 'digital intensive' service sectors enjoy a 2-3 per cent higher mark-up than firms operating in less digital intensive sectors.[79]

Based on the theses discussed in this chapter, digitalisation's 5Ps combination could create new growth opportunities and seismically bring back business (B3) initiatives in an accelerated manner while eliminating negative bleedingness. AfCFTA should collaborate strategically with African-led cloud systems towards deploying ground-breaking data tools in the trade facilitation innovation space. Data engineers provide trade innovation measures, data analytics, and data science capabilities to trade innovation teams and leaders across the continent, thereby providing comprehensive digital offerings, greater transparency, accountability, and deeper insights with better outcomes at lower costs. Furthermore, blockchain technology remains a potential enabler that decentralises trade and enhances trust among enterprises, businesses, and the world towards digitising trade and commodities supply chains. This will enhance Africa's preparedness for the future of evidence-based trade-facilitation policy processes as it strategically overcomes its inherent bleeding trade phenomenon. In other words, rather than calibrating the future of AfCFTA, trade policy making would benefit from positive bleeding trade by deploying 5Ps and blockchain technology toward maximising its digital-enabled trade ecosystem.[80] [81]

Africa's trade tech legislation prioritisation should consider trade facilitation technologies and digital trade tools for strengthening MSMEs' capacities to build back better, diversify the national/regional economic base, add value (especially local contents) to production and exports, promote sustained growth, and overcome COVID-19 shocks. In addition to assessing Africa's digital transformation, this chapter investigates how tradetech facilitation innovation could be enhanced by implementing how Africa can deploy 'non-bleeding' tools and strategies for upping its game in the post pandemic digital age. Thus, this chapter concludes that promoting intra and intercontinental regulatory harmonisation and cooperation is crucial for gearing Africa for the future of digital trade

79 S Calligaris, C Criscuolo & L Marcolin 'Mark-ups in the digital era' OECD Science, Technology, and Industry Working Papers (2018) 2018/10, Paris https://www.oecd-ilibrary.org/industry-and-services/mark-ups-in-the-digital-era_4efe2d25-en (accessed 21 August 2021).

80 See ch 1 (introduction) and ch 10 (conclusion). On the concept of 'positive accident', see Taleb (n 40). In addition, see Lim (n 46).

81 B Adekunle & G Filson 'Blockchain technology and asymmetric information in the food market' (2019) A selected paper presented at the IAABD 2019, 8-11 May 2019, Dar es Salaam, Tanzania.

agreements, sustainable trade facilitation innovation and the continental digital economy.

References

Adekunle, B & Filson G 'Blockchain technology and asymmetric information in the food market' (2019) A selected paper presented at the IAABD 2019, 8-11 May 2019, Dar es Salaam, Tanzania

Adekunle, B & Kajumba, C 'The nexus between Instagram and digital entrepreneurship' (2020) 21 *Journal of African Development* pp. 14-40

Africa News 'Nigeria&#39 oil revenue falls by 80 per cent' Africa News (7 May 2020), https://www.africanews.com/2020/05/06/nigeria-s-oil-revenue-falls-by-80-percent//

AUC/OECD, Africa's Development Dynamics Digital Transformation for Quality Jobs, (2021). AUC, Addis Ababa/OECD Publishing, Paris, https://doi.org/10.1787/0a5c9314-en

AUC/OECD. Africa's Development Dynamics 2019: Achieving Productive Transformation. (2019) OECD Publishing, Paris/African Union Commission, Addis Ababa, Paris https://doi.org/10.1787/c1cd7de0-en

Babaioff, M, Dughmi, S, Kleinberg, RD & Slivkins, A 'Dynamic pricing with limited supply' (2015) 3 *ACM Tran. on Economics and Computation* 4

Babaioff, M, Feldman, M & Nisan, N 'Combinatorial agency' in 7th ACM Conf on Electronic Commerce (EC) (2006)

Bloch-Wehba, H 'Content moderation as surveillance' (2022) 36 *Berkeley Technology Law Journal*, Forthcoming, SSRN: ttps://ssrn.com/abstract=3872915

Bolton, P & Dewatripont, M *Contract theory* (MIT Press 2005)

Blum, A, Haghtalab, N, Hajiaghayi, M & Seddighin, S 'Computing Stackelberg equilibria of large general-sum games' in Fotakis, D & Markakis, E (eds) Algorithmic game theory (SAGT 2019) Lecture Notes in Computer Science (2019), vol 11801. Springer, Cham. https://doi.org/10.1007/978-3-030-30473-7_12

Buseh, AG, Stevens, PE, Bromberg, M & Kelber, ST 'The Ebola epidemic in West Africa: Challenges, opportunities, and policy priority areas' (2015) 63 *Nursing Outlook* 30

Calligaris, S, Criscuolo, C & Marcolin, L 'Mark-ups in the digital era' OECD Science, Technology, and Industry Working Papers (2018) 2018/10, Paris https://www.oecd-ilibrary.org/industry-and-services/mark-ups-in-the-digital-era_4efe2d25-en (accessed 21 August 2021)

Carroll, G 'Robustness and linear contracts' (2015) 105 *American Economic Review* 536

Conitzer, V & Sandholm, T 'Computing the optimal strategy to commit to' in Proceedings of the 7th ACM Conference on Economics and Computation (EC) 82

Coase, RH 'The nature of the firm' (1937) 4 *Economica* 386

Dütting, P, Ezra, T, Feldman, M, & Kesselheim, T 'Combinatorial contracts' (2021) in Proc. IEEE FOCS 2021. 815

Economic Intelligence Unit (EIU). Open Secrets? Guarding Value in the Intangible Economy' (2021) The Economist Intelligence Unit

Emek, Y & Feldman, M 'Computing optimal contracts in combinatorial agencies' (2012) 452 *Theoretical Computer Science* 56

Haider, A 'Open secrets? Guarding value in the intangible economy' (2021) *The Economist Intelligence Unit*

Ho, C, Slivkins, A & Vaughan, JW 'Adaptive contract design for crowdsourcing markets: Bandit algorithms for repeated principal-agent problems' (2016) 55 *Journal of Artificial Intelligence Research* 317

Kapron, Z 'From digital payments to digital finance: How China's tech companies are redefining banking in Asia and soon Europe' (2018) 12 *Journal of Payments Strategy and Systems* 68

Kim, JG, Na, SK, Lee, J, Yun, C & Kim, E 'Digital platform markets of ASEAN and India: Implications for cooperation with Korea' (2021) KEIP World Economic Brief (WEB) 21-33 - Digital Platform Markets of ASEAN and India: Implications for Cooperation with Korea | World Economy Brief | Publications: Korea Institute for International Economic Policy (kiep.go.kr)

Kyu Yub Lee, 'New Rules for the Digital Economy and Multilateral Cooperation' (2020) KIEP Opinion 182 – New rules for the digital economy and multilateral cooperation | KIEP Opinions | Publications: Korea Institute for International Economic Policy

McKinsey & Company 'How the COVID-19 crisis may affect electronic payments in Africa'(2020), https://www.mckinsey.com/~/media/McKinsey/Industries/Financial per cent20Services/Our per cent20Insights/How per cent20the per cent20COVID per cent2019 per cent20crisis per cent20may per cent20affect per cent20electronic per cent20payments per cent20in per cent20Africa/How-the-COVID-19-crisis-may-affect-electronic per cent20payments-in-Africa.pdf

Laffont, J & Martimort, D *The theory of incentives: The principal-agent model* (Princeton University Press 2002)

Lim, J 'How digitalisation averted cross-border trade disaster in Asia – Tech Wire Asia' (2021), https://techwireasia.com/2021/07/how-digitalization-averted-cross-border-trade-disaster-in-asia/

Mambrol, N 'The sociology of Emile Durkheim. Literary theory and criticism' (2015)

Nisan, N & Ronen, A 'Algorithmic mechanism design' (2001) 35 Games and Economic Behaviour 166, ISSN 0899-8256, https://doi.org/10.1006/game.1999.0790 (https://www.sciencedirect.com/science/article/pii/S089982569990790X)

Odularu, GOA & Adekunle, B 'Digitalisation in the African context' (2021) 21 *Journal of African Development*, pp 1-13

Odularu, G 'The primer: Bracing Nigerian trading ecosystem for the future' in Odularu, G (ed) Strategic policy options for bracing Nigeria for the future of trade (Palgrave Macmillan 2020), pp 1-9

Odularu, G 'Conclusion and policy recommendations' in Odularu, G (ed) *Strategic policy options for bracing Nigeria for the future of trade* (Palgrave Macmillan 2020), pp 221-226

Odularu, G 'Digital pathways for fostering post-COVID-19' (2020), https://www.afronomicslaw.org/2020/07/18/digital-pathways-for-fostering-post-covid-19-trade-outcomes/?fbclid=IwAR2FOS9d9U6epp8ItvrqhRlJkfmevHPbITuPmdaXRqt0ed9X12oYEH6U5Fk

Odularu, G 'Building businesses back better amid COVID-19 pandemic in Africa' in Crisis and Fragility: Economic Impact of COVID-19 and Policy Responses' KIEP Visiting Scholars' Opinion Paper (2020) p 193

Odularu, G, Adetunji, B & Odularu, G 'Conclusion and policy recommendations: Creating an enabling business ecosystem for fostering trade opportunities in the digital age' in Odularu G, Hassan, M & Babatunde, M (eds) *Fostering trade in Africa. Advances in African economic, social and political development* (Springer 2020) pp. 213-218

Odularu, G & Alege, P *Trade facilitation capacity needs* (Palgrave Pivot (2019)

Pedro, S 'COVID-19 pandemic: Shifting digital transformation to a high-speed gear' (2020) 37 *Information Systems Management* 260

Rodrik, D *One economics, many recipes: Globalisation, institutions, and economic growth* (Princeton University Press (2007)

Salanie, B *The economics of contracts: A primer* (MIT Press 2005)

Sergeev, A, Douglas, AW & Charamba, K 'Policymakers, big FinTech's and the United Nations Sustainable Development Goals' (2021) The Dialogue on Global Digital Finance Governance Paper Series, Technical Paper 3.1, 2021,

University of Hong Kong Faculty of Law Research Paper 2021/30, SSRN: http://dx.doi.org/10.2139/ssrn.3870612

Taleb, NN *Fooled by randomness: The hidden role of chance in life and the markets* (Random House 2004)

Taleb, NN *The black swan: The impact of the highly improbable* (Penguin 2007)

Taleb, NN 'The fourth quadrant: A map of the limits of statistics' unpublished manuscript (2008), http://www.edge.org/3rd_culture/taleb08/taleb08_index.html

Taleb, NN & Pilpel, A 'On the unfortunate problem of the no observability of the probability distribution' unpublished manuscript (2004) http://www.fooledbyrandomness.com/knowledge.pdf

Thaler, RH 'Anomalies: The winner's curse' (1988) 2 *Journal of Economic Perspectives* 191

Wong, KLX & Dobson, AS 'We are just data: Exploring China's social credit system concerning digital platform rating cultures in Westernised democracies' (2019) 4 *Global Media and China* 220

Zhang, L & Chen, S 'China's digital economy: Opportunities and risks'(2019) IMF Working Paper WP/19/16