13th COMESA ANNUAL RESEARCH FORUM

Leveraging Frontier Technologies and Innovation to Advance Regional Integration for Sustainable and Inclusive Growth in COMESA

Call for Submissions

Background

Frontier technologies (FT) hold significant promise for accelerating inclusive growth, improving livelihoods, and addressing development challenges. Investments in FT can enable African countries to leapfrog traditional development pathways and position themselves competitively in the global digital economy. A country's competitiveness depends on the capacity of its industry to innovate and upgrade (ESCAP, 2018).

There is no consensus on the definition of frontier technologies. They are technologies that can profoundly disrupt existing production processes and products (TPIS, 2022). Frontier technologies are a group of new technologies that build on frameworks of digitalization and connectivity to enable them to combine and multiply their impacts. These technologies can have dramatic impacts on economies and societies as well as on the development of other technologies (UNCTAD, 2021). According to Organisation of Economic Co-operation and Development (OECD), the following 10 technologies may have more significant impacts than others: Artificial Intelligence (AI); additive manufacturing (3D printing); advanced energy storage technologies; big data analytics; blockchain; nanomaterials; nano/micro satellites; neurotechnologies; synthetic biology; and the Internet of Things (IoT). In 2023, frontier technologies represented a $2.5 trillion market, and it is estimated to increase sixfold, to $16.4 trillion, in the next decade (UNCTAD, 2025). AI is set to be the key source of transformation, disruption and competitive advantage in today's fast changing economy. AI could contribute about $15.7 trillion to the global economy by 2030 (Rao & Verweij, 2017).

There is a distinction between FT and digital technologies. Digital technologies are established, widely adopted technologies that mainly focus on processing, storing, and transmitting information. They form the backbone of today's digital economy. They are mature and proven, broadly accessible and affordable, incremental improvements over time and are already embedded in everyday life and business. On the other hand, FT are emerging and major drivers of innovation often consist of new or significantly improved tools, materials or business models that enable firms to bring to market innovations that may have previously been costly, inefficient or unrealistic. They are new or rapidly evolving, often experimental or early-stage, high uncertainty but high impact and can also disrupt existing systems other than improve them.

Many frontier technologies can be classified as general-purpose technologies (GPT). Unlike technological progress which is often an incremental innovation in a specific sector or area, a GPT has the potential to re-shape the economy and boost productivity across all sectors and industries. The GPT have the following characteristics (i) pervasiveness, should spread to most sectors; (ii) improvement, able become more efficient and effective over time and keep lowering costs for users; and (iii) should be innovation spawning to enable the invention and development of new products or processes (ESCAP, 2018). These technologies can boost productivity and improve livelihoods. AI, for example, combined with robotics can transform production and business processes. 3D printing allows faster and cheaper low-volume production and rapid, iterative prototyping of new products (UNCTAD, 2021). At the country level, frontier technologies can improve global competitiveness and foster industrialisation and sustainable development (TIPS, 2022).

Harnessing Frontier Technologies for Sustainable Development

Frontier technologies offer potential benefits in economic, social and environmental development. The diffusion of new and disruptive technologies might offer a window of opportunity for developing countries to accelerate their rate of economic development and catch up (UNTAD, 2022). However, in pursuing these policy objectives, developing countries face challenges such as demographic changes, low technological innovation capacities, weak financing mechanisms, slow diversification, and stringent protection of intellectual property.

From an economic perspective, adoption of technologies and innovation in production processes increases overall productivity and expands production possibilities across various sectors of the economy. Specifically, FT hold enormous potential for enhancing regional trade through market integration and trade facilitation, value addition, and infrastructure connectivity. For instance, some of the benefits in customs management include risk management and profiling, fraud detection, and greater compliance being the most prevalent, facilitating customs audits and identification of anomalies, and improving revenue collection. Specifically, blockchain has a potential to facilitate customs processes from Customs clearance to inter-agency cooperation, certification, identity management, compliance management, revenue collection and post-clearance audit (WCO/WTO, 2022). In transport and logistics, AI offers significant potential in autonomous trucking and delivery, traffic control and reduced congestion, and enhanced security (Gikunda & Kutu, 2023).

Besides, big data and IoT are new digital developments that make it possible to optimize business operations and facilitate the creation of new products, services and industries (ESCAP, 2018). The application of smart, digital, and precision technologies has already had a significant impact on farming worldwide, primarily in large-scale farming in high-income countries. These technologies can also play a role in mitigating information asymmetries by providing real-time and precise data that inform smallholder farmers in their decision-making at every stage of the agricultural cycle leading to increased agricultural productivity (UN, 2021). In India, CropIn start-up provides analytics and software solutions for crop management, it has developed a vegetation index using satellite imagery that provides support to farmers in decision-making to ensure crop health (ESCAP, 2018).

In financial services sector, AI, IoT, big data and blockchain have been used in financial sector for credit decisions, risk management, fraud prevention, trading, personalized banking, and process automation, as well as predictive maintenance, quality control and human-robot combined working activities in the manufacturing sector (UNTAD, 2021). Block chain has been used in trade finance to simplify processes, reduce settlement times, errors, fraud and disputes and build trust between parties in a transaction (ESCAP,2018) .In the manufacturing sector, AI has the potential to enhance monitoring and auto-correction of manufacturing processes, supply chain and production optimization, and on-demand production (Gikunda & Kutu, 2023).

According to ESCAP, 2018, FT contribute to the achievement of the 2030 Agenda for Sustainable Development Goals including ending poverty, agriculture, health, education, energy, water, environment and climate. For example, AI has a significant potential in energy smart metering, more efficient grid operation and storage, and predictive infrastructure maintenance offering consumers a more efficient and cost-effective supply and usage of energy (Gikunda & Kutu, 2023). In countries with functional health systems, big data and IoT could contribute to improving health care by allowing treatments to be personalized, clinical data to be collected beyond the occasional patient–doctor visit, disease progression to be detected earlier and treated proactively (UNCTAD, 2018). During the COVID-19 pandemic, AI and big data was used for screening patients, monitoring the outbreaks, tracking and tracing cases of the disease, predicting its evolution and assessing infection risks. (UNCTAD, 2021). Smart cities reduce traffic, pollution, save energy and water and create a cleaner environment among other benefits (ESCAP, 2018).

Application of Frontier Technologies in COMESA Region

The application of FT in COMESA is limited, with the focus mainly being on digital technologies. Various digital trade facilitation instruments have been developed including COMESA Virtual Trade Facilitation System (CVTFS), Electronic Certificate of Origin (eCO), Regional Electronic Single Window, Trade Information Portals (TIP) and COMESA Regional Payment and Settlement System (REPSS).

Currently, investments in FT in COMESA is haphazard and not coordinated. However, there are some FT applications, mostly private sector driven in agriculture, health, and customs, among others. For example, UjuziKilimo, an AI platform in Kenya provides agricultural data to small holder farmers. In Uganda, Farmers Companion App, an open-source machine learning platform is being used to prevent the spread of fall army worm from damaging crops (Foster et al 2023). Data mapping applications have been used to facilitate decision making on allocation of medicine and mobilization of health teams during typhoid outbreak in Uganda (UNCTAD 2018). Kilimo Salama (Safe Farming) microinsurance project launched by UAP insurance company in Kenya uses big data on climate and crop trends, to determine the appropriate compensation plan for the current year without the need to assess individual cases. Farmers can receive insurance policy numbers and premium receipts via short message service (SMS) and insurance payouts via the M-PESA platform. A total of 233,795 farmers were insured in Kenya and Rwanda in 2014 (UNCTAD, 2018). Drones are being used for delivering medical supplies to remote communities in Rwanda (UNCTAD, 2021).

Some customs administrations are using chatbots to respond to the questions they receive on their website for example, Zambia Revenue Authority (ZRA) uses a chatbot to engage with taxpayers alongside other customer service channels of phone, email, and social media etc. The taxpayer service chatbot (Zax) uses natural language processing to answer basic questions via a business messenger (WCO/WTO, 2022). An AI enabled start-up has discovered the largest copper deposit in over 100 years in Zambia (Republic of Zambia, 2024).

Frontier Technologies Readiness in COMESA

The frontier technologies readiness index by UNCTAD provides a comprehensive measure of a country's preparedness for frontier technologies on a scale of 0 to 1. It consists of indicators to measure country's capacity to use, adopt and adapt frontier technologies namely information and communications technology (ICT) deployment, skills, research and development activity, industrial capacity and access to finance.

Table 1: COMESA Frontier Technology Readiness Index, 2023

Country	Overall Index	ICT	Skills	Research and Development	Industry Activity	Access to Finance
Burundi	0.1	0	0.1	0	0.2	0.8
Comoros	0.2	0.2	0.3	0.1	0.2	0.8
Dem. Rep. of the Congo	0.1	0.2	0.2	0.2	0	0.7
Djibouti	0.3	0.4	0.3	0.1	0.5	0.8
Egypt	0.5	0.6	0.4	0.5	0.4	0.8
Eswatini	0.3	0.4	0.5	0.1	0.4	0.8
Ethiopia	0.2	0.1	0.2	0.4	0.3	0.8
Kenya	0.4	0.5	0.3	0.3	0.5	0.8
Libya	0.4	0.6	0.5	0.2	0.3	0.7
Madagascar	0.2	0.3	0.1	0.1	0.3	0.7
Malawi	0.2	0.2	0.2	0.2	0.3	0.7
Mauritius	0.5	0.7	0.5	0.3	0.5	0.9
Rwanda	0.3	0.5	0.2	0.2	0.3	0.8
Sudan	0.1	0.3	0.2	0.2	0	0.6
Tunisia	0.5	0.6	0.5	0.4	0.6	0.9
Uganda	0.2	0.1	0.2	0.2	0.3	0.7
Zambia	0.2	0.3	0.3	0.2	0.2	0.7
Zimbabwe	0.2	0.4	0.2	0.2	0.2	0.7
COMESA Average	**0.3**	**0.36**	**0.29**	**0.22**	**0.31**	**0.76**
Global Average	**0.5**	**0.63**	**0.47**	**0.33**	**0.46**	**0.82**

Source: UNCTAD

*Data not available for Seychelles, Eritrea, and Somalia.

Table 1 shows COMESA's frontier technology readiness index. COMESA is least prepared for frontier technology with an average overall index score of 0.3, below the global average of 0.5. Egypt, Mauritius, Tunisia have overall index score of 0.5 equivalent to the global average overall index score. 15 Member States have overall index score below the global average of 0.5 while (10) are below the regional average overall index score of 0.3. This compares unfavourably with the best prepared countries globally namely the Netherlands, Sweden, United Kingdom and United States with overall index score of 1 and nine (9) European Union Member States, Australia, Canada, China (Hong Kong SAR), Israel, Norway, Republic of Korea, Switzerland and Singapore with overall index score of 0.9. COMESA preparedness varies in terms of the readiness indicators ranging from an average score of 0.76 in access to finance to 0.22 in research and development.

According to UNCTAD 2025, developing countries should prepare for a world that is rapidly being reshaped by AI and other frontier technologies. There is need to develop next generation technology policy framework for the frontier technologies appropriate to their development stage and economic, social and environmental conditions. Some of the key policy areas include inclusive ICT infrastructure; developing a workforce fit for a Fourth Industrial Revolution future; developing innovative regulatory frameworks; incentivizing responsible frontier technology development in the private sector; catalysing the role of government in frontier technologies' evolution; and creating a platform for multistakeholder and regional cooperation (ESCAP, 2018).

Policies for frontier technologies and AI add new rationales for industrial policies, most AI policies have emerged from developed countries. By 2023, about two thirds of developed countries had a national AI strategy (UNCTAD, 2025). African countries are increasingly formulating national AI strategies to guide the adoption of AI which are aligned with global trends in AI policies including; basic and applied research in AI, talent attraction, development, and retention, considerations for the future of work and skills, the industrialization of AI technologies, public sector utilization of AI, data and digital infrastructure, ethical considerations and regulatory frameworks inclusion, and foreign policy (Gikunda & Kutu, 2023). As of 2025, nine (9) COMESA Member States were among 16 African countries that had developed national AI strategies namely Egypt, Kenya Rwanda, Mauritius, Ethiopia, Tunisia, Uganda, Zambia and Libya. Some of the strategies are aligned to the African Union Continental Strategy for AI.

Research Theme

COMESA will host the 13th Annual Research Forum from 14-18 September 2026. The Forum brings together various stakeholders, including policy makers, academia, think tanks and private sector to deliberate on topical issues on trade and regional integration. The Forum is also a capacity building avenue in economic and trade policy research for young researchers. Successful research papers are published in COMESA flagship publication "Key Issues in Regional Integration."

In this regard, COMESA calls for Extended Abstracts under the theme; **"*Leveraging Frontier Technologies and Innovation to Advance Regional Integration for Sustainable and Inclusive Growth in COMESA*"** with the following sub-themes.

i. Frontier technologies for advancing agricultural productivity, green industrialisation, and climate-resilient value chains in COMESA.
ii. The role of frontier technologies in facilitating trade in COMESA
iii. Frontier technology-led integration through development and harmonization of policy and regulatory frameworks, development of digital skills, and innovation ecosystems in COMESA.
iv. The role of frontier technologies and innovation in strengthening small, and medium enterprises (SMEs) in COMESA.
v. Harnessing data to drive regional integration strategies and decision-making for sustainable and inclusive growth in COMESA.

COMESA invites researchers to submit Extended Abstracts under the different sub-themes. The Extended Abstracts will be peer reviewed and successful authors invited to submit draft papers and thereafter final papers. The successful authors will be invited to make presentations at the 13th COMESA Annual Research Forum scheduled for September 2026.

Submission Requirements for Extended Abstracts

The Extended Abstracts should have the following structure:

Abstract Title: Topical issue drawing from the sub-themes in the context of overall theme.

Background: The context of the research flagging underlining issues that necessitate investigation, existing gaps of knowledge that the research paper attempts to fill, stating clearly the problem statement /issue being investigated..

Objective(s): The general and specific objectives of the paper or the Research questions that the paper seeks to answer.

Methodology: A description of the proposed methodology (quantitative or qualitative) including econometric and/or survey tools where applicable, estimation technique, data type and sources.

Submission

Extended Abstracts should be submitted in word electronic form to Dr Christopher Onyango at Conyango@comesa.int with copies to Ms. Jane Kibiru at Jkibiru@comesa.int, and Machangani Chongola at mchongola@comesa.int.

Submission Deadline: 10 March 2026