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Digital Technologies in Intra-African Trade: A Bibliometric Analysis

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Abstract
The 2030 Agenda for Sustainable Development, adopted by the United Nations (UN) in 2015, includes 17 Sustainable Development Goals (SDGs) aimed at addressing global challenges and achieving a better and more sustainable future.
Promoting goals 8 and 9 in Africa can significantly benefit intra-African trade where goal 8 is aimed at promoting sustained, inclusive, and sustainable economic growth, within Africa and goal 9 is at promoting inclusive and sustainable industrialization and fostering innovation, enhancing infrastructure and reducing the digital divide. Digital Technologies, inclusive of emerging technologies, have revolutionized global trade and simplified transactions between customers, regardless of geographical location. Emerging Technologies such as blockchain, artificial intelligence (AI), and the Internet of Things (IoT) can further transform digital trade, blockchain, for instance, enhances transparency and security in transactions, while AI and IoT optimise supply chain management. This research aims to explore the effects of digital technologies as applied in intra-African trading. By using a bibliometric analysis, the researcher seeks to understand the existing literature, identify key trends and gaps, and provide valuable insights for optimizing ICT in intra-African trade for sustainable development. The findings show the main themes analysed and recommendations on the digitalization of intra-African trade as well as provide some insights into implications for policy and practice.

Keywords: intra-African, sustainable development, blockchain, artificial intelligence (AI), and the Internet of Things (IoT)

1. Introduction

Africa can eradicate not only the digital divide but also poverty. However, this potential is not being realised because local producers face more barriers in getting their food to market than anywhere else in the world. Too often, achieving a world without hunger remains elusive as extreme poverty and hunger continue to distress over 800 million people today (Food and Agriculture Organization (FAO) et al. 2018). Disturbingly, famine and severe food insecurity, are on the rise again in almost all sub-regions of Africa (FAO et al. 2019). In the face of increasing food insecurity and malnutrition, the question remains, what can be done to hasten progress towards achieving the Sustainable Development Goals (SDGs) of a world without hunger? Post the COVID-19 pandemic, the importance of strengthening digital trade in Africa has become significant.

The spread of the pandemic led to a contraction in the global economy of 3.9% in 2020. This economic slowdown, accompanied by pandemic lockdowns, adversely affected international trade with Africa where exports and imports declined by 8.1 and 8.8%, respectively (WTO, 2021). Nevertheless, within this global slowdown, digital trade experienced extraordinary growth, bringing massive gains to digital exporters. During the pandemic, global e-commerce grew by 27.6% however Middle East whilst Africa lagged with growth, at 19.8% (OBERLO, 2020). Further, Africa's share in digital exports of goods and services has not compared to other regions like Asia and the Pacific thus losing on a significant opportunity. The growing digital divide between Africa and the rest of the world, as well as within Africa, may eclipse the growing opportunities offered by global digital trade. Therefore, African countries need to implement policies at the national, regional, and international levels to boost African digitalisation.

2. Literature review

Overview of digital trade in Africa
ICT has had a positive impact on Africa, driving economic growth, and improving access to education and healthcare. However, challenges

such as the pandemic, digital divide, infrastructure costs and cybersecurity threats still need to be addressed to ensure that the benefits of ICT are widely distributed across the continent. As ICT continues to evolve, it will play an increasingly important role in shaping Africa's future development. Digitalisation and digital technologies have profoundly changed the thinking and processes around Trade (Kere & Zongo, 2023). In terms of trade Kere and Zonga (2023) highlight that Africa's demographic dynamics of over 1.2 billion people have huge potential however, since 1995, Africa's share of world trade has not exceeded 5% with Nigeria and South Africa contributing to 40% Oramah (2021). According to the study by WTO (2020), to engage in and profit from digital trade, businesses must have access to inexpensive and dependable digital infrastructure and have the competencies to use digital technologies.

In Sub-Saharan Africa, studies show a growth in the use of wide-ranging digital infrastructures of internet, fixed broadband, telephone and mobile cellular (Kouladoum, 2023). For example, it has become rare that a payment cannot be made using a mobile phone. The increase in the speeds and efficiencies of these technologies is transforming global flows of goods, services, money and people (Lund and Manyika, 2016). Understandably, mobile phones are central to the digital transformation of African countries. According to GSMA (2022), mobile phones are fundamental to digital transformation in Sub-Saharan Africa as smartphone adoption could reach 75% by 2025.

The growing digital connectivity and access propels new business models resulting in digitally enabled trade. In addition, the rise in digital payments has equally contributed to the shift in many areas of trade. Market boundaries are distorting, and agent roles continuously change because of rapid technological advancements (Verhoef et. al, 2021). Lopez-Gonzalez and Jouanjean (2017, p.5) define digital trade as “digitally enabled transactions in trade in goods and services which can either be digitally or physically delivered and which involve consumers, firms and governments”. Digital Trade involves the exploitation of digital tools and data flows to ensure the delivery of goods and services to consumers, accounting for a growing portion of international trade. An important aspect of what distinguishes digital trade from traditional trade is data flow and its access, which is becoming increasingly crucial in existing economies. Another key aspect of Digital Trade is its transformative property in how and what is traded without changing why people trade (Lopez-Gonzalez and Jouanjean,2017) Digital trade offers an innovative tool for advancements in the trade industry combined with better income generation capacities. This promises opportunities to positively transform African economies. Firstly, digital trade promises consumers a better experience in transactional capacity and choices regarding suppliers. Secondly, businesses benefit by expanding the pool of customers and suppliers on a global scale for organisations and governments. Laterally, the expanded reach for both customers and businesses also means that new capacities and business models are created for the delivery of goods and services as well as increased data flow across borders

Digital trade and intra-African trade for sustainability

A significant driving force behind global sustainability objectives is the integration of digital technology into trade. Chen and Gao (2022) assert that digital technology integration presents opportunities that lead to improved transparency in supply chain operations and optimised resource utilisation, among others. Jiang and Jia (2022) further argue that digital trade encourages the trading of used goods with the double benefit of reduced waste and environmental harm. Innovative approaches to trade and industry operations can be realised with digital trade. This is beneficial for many African countries in job creation. Along with the opportunities that digital trade promises, aspects of the digital divide, data governance and data protection are some of the challenges it brings (UNECA, 2019). In Africa, many policymakers are struggling to provide and resolve challenges about the provisioning of basic digital connectivity (Foster and Azmeh, 2018). Such challenges perpetuate digital divide issues already inherent in African states. Banga et al (2021) assert that data protection and privacy, followed by electronic trade facilitation and consumer protection are top-ranked for improving intra-regional digital trade in Africa. The inclusion of data protection and privacy regulations in trading agreements has been necessitated by laws and regulations, such as the PoPIA Act in South Africa, which advocate for better retention of control over personal information. Based on the dashboard on data protection and privacy

provided by the United Nations Conference on Trade and Development (UNCTAD) only 61% of African countries have adopted legislation regarding data protection and privacy (UNCATD, 2023). Other researchers have concluded the importance of accountability and management of digital trade resources to ensure an achievable and balanced sustainable development (Xu et al, 2020). The role of AfCFTA in providing a guiding framework is crucial to ensure data protection or privacy as well as effective trade facilitation measures in intra-African digital trade. Ultimately, digital trade poses a challenge for African countries, thereby pro-active regulatory approaches are required to ensure that benefits are successfully realised, with the aim towards a sustainable future.

Policy Implications: The need for regulatory alignment to benefit digital trade

For effective digitalization to transpire, government, policymakers and other relevant stakeholders should prioritise the deployment of internet connectivity including fibre optics to rural districts. Increasing access to the Internet can create opportunities within the community and mitigate the pace of relocation to urban areas (World Bank, 2005). According to the African Development Bank (2018a), electricity costs in Africa are much higher than in other developing regions, and most manufacturers in West and East Africa rely on backup generators as a primary energy source, adversely affecting their profit margins. Hence, is it important that governments implement policies and seek solutions to provide more cost-effective access to electricity, particularly in rural areas. Other policies that would also be beneficial are to reduce import and export tariffs on digital tools which can significantly enhance trade across Africa and even promote small businesses to participate more actively in trade.

2. Methodology

This paper applies a bibliometric analysis in investigating Digital trade on intra-African trade and sustainability. Bibliometric analysis is a quantitative method for evaluating scholarly research output. It uses statistical methods to analyse bibliometric data, such as the number of citations, the number of authors, and the publication venue. Bibliometric analysis can be used to assess the impact of individual researchers, institutions, and countries as well as track the development of research fields over time. (Zupic and Čater, 2015).

One of the benefits of employing the bibliometric review is that it helps the researcher draw on information such as keywords, themes, and key concepts from journals, or conferences that have previously been published. (Zupic and Čater, 2015). For this study, a bibliometric analysis was conducted using the Dimensions database to identify and analyse relevant academic publications on the impact of ICTs on trade in Africa. The search terms "ICT," "trade," and "Africa" were used to retrieve publications from a variety of sources, including journals, books, and conference proceedings. The publication year was limited to the period from 2019 to 2023 to capture the most recent research on this topic. Gil et al. (2020) the use of a bibliometric analysis due to its increase in popularity for defining various aspects of scientific production. For this study, the researcher began by drawing on key concepts that were used as input to search the DIMENSIONS database, a scholarly database, from the period 2018 to 2023. The output of the search is exported for Bibliometric Mapping in an Excel spreadsheet comma-separated values (.csv) format. The Excel spreadsheet was then imported into the VOSviewer (v.1.6.19) a software tool to create a co-occurrence map based on text data.

The bibliometric analysis revealed a significant increase in studies on the impact of ICTs on trade in Africa from 2015 to 2024 as depicted in Figure 1. This suggests that the topic is gaining increasing attention from researchers and gained momentum during the pandemic reaching a peak in 2023.

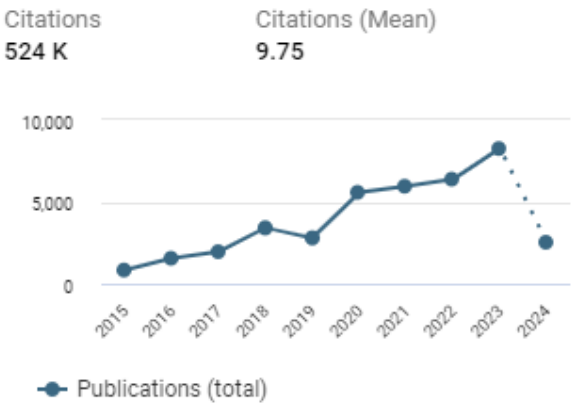

Figure 1: Citations

3. Evaluation and discussion

The maps produced make use of quantitative data to reveal clusters. (Van Eck, 2010). These clusters are represented in the form of visualization maps, where emerging themes are represented in a circle. The size of the label and the circle of an item are determined by the weight of the item. The larger the circle the larger the item as in Figure 4 below. The color of an item is determined by the cluster to which the item belongs. Lines between items represent links. The map produced in Figure 1 highlights keywords used were “ICT” and "intra-Africa Trade". The publication type was mainly journals and articles. After exporting the data from the Dimensions Database, a network density map using VOSviewer was generated as in Figure 2.

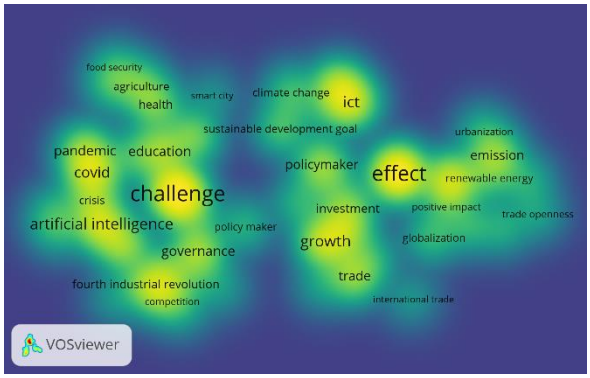

Figure 2. Density map

The map in Figure 2 highlights the areas of high density, which indicates topics with a high level of interconnectedness. The emerging areas of research show clusters that are growing over time by the size of each node representing the importance of the node in the research. The map will be analysed in the next section. The analysis also identified two key themes in the research, highlighted by the words challenges and effects.

Challenges and effects of Technology in Africa

The overlay visualization map in Figure 3 was used to explore and understand the relationships, and patterns, within large nodes over time. In this instance, the focus was on keyword co-occurrence making it easier to identify key trends. Keywords that formed large nodes were challenge and effect. The following sub-sections will explore this further.

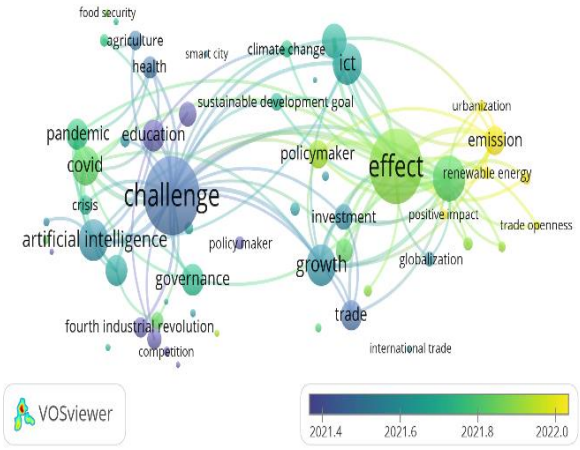

Figure 3. Overlay Visualisation

Effects of Technology in Africa

Technology no doubt has the potential effect to play a transformative role in Africa, addressing issues such as sustainability, globalisation, and international trade and unlocking opportunities for investment, economic growth and policymaking. Probing into the academic resources that were used to create the maps Adeleye et al. (2021) highlights the effect of ICT on inclusive growth in 53 African countries from 2005 to 2015. Adeleye et al. (2021) found that there is significant evidence that trade is enhancing inclusive growth in Africa. Nchofoung and Asongu (2022) conducted a study on the effect of ICT on sustainable development. Their results show that ICT has a positive and significant effect on sustainable development. Ofori and Asongu (2021) whose findings confirmed that technology enhances the level of inclusive growth in Africa

In Sub-Saharan Africa, studies show a growth in the use of wide-ranging digital infrastructures of internet, fixed broadband, telephone and mobile cellular (Kouladoum, 2023). For example, it has become rare that a payment cannot be made using a mobile phone. Understandably, mobile phones are central to the digital transformation of African countries. However, it is important to carefully consider the impact of technology use in Africa. Probing further into the information cluster analysis, Figure 4 probes into the links between the effects of ICT and the challenges it poses.

Challenges experienced with Technology in Africa

ICT has the potential to drive significant economic and social development in Africa. However, the continent faces several challenges in fully realizing this potential. Some of the key challenges identified in the smaller cluster that are linked to it are COVID-19, education, governance, health, and artificial intelligence. The fourth industrial revolution and Artificial intelligence (AI) have brought new opportunities but have also been accompanied by some challenges. The pandemic certainly posed a crisis for many African countries in the sectors of education and health among others. Addressing these challenges requires a coordinated effort involving governments, the private sector, international organizations like the WTO, and civil society. Strategies include investing in infrastructure, education, ICT skills development to bridge the digital divide, and fostering innovation and entrepreneurship in the AI and ICT sectors.

4. Conclusion

Despite this progress, Africa still faces several challenges. Poverty remains a major problem, with over 400 million people living below the international poverty line. Despite the challenges it faces, the researchers note in the map that technology has the potential to achieve sustainable development, impact the economy, and contribute to the mayhem the pandemic may have caused. Panichsombat (2016) highlighted that the rise in information and communication technology diffusion and human capital in Africa has offered glimpses of hope despite the region's challenges social inequality, inefficient resources and poor infrastructure which are key developments aspects to address in any economy with growth prospect (Nchofoung et al. 2022).

The bibliometric analysis has shown that ICTs have the potential to play a significant role in transforming trade in Africa but there are still several challenges that need to be addressed. For example, challenges like the digital divide, policy, and good governance are crucial for maximising the benefits and ensuring sustainable development. Kocsis (2020) states that robust ICT infrastructure will create entrance to online services, bridge the digital divide, and initiate employment opportunities. Further research, however, is needed to fully understand the impact of ICTs on trade in Africa, identify the most effective policies for promoting the use of ICTs and assist in making trade more efficient, transparent, and competitive. Even though Africa lags behind the rest of the world in digital technologies Evans (2019) states we need not just to eradicate the digital divide but to grow the digital dividend in terms of sustainability, economic growth, and reduce poverty and income inequality. Digital technologies, including emerging technologies, have revolutionized global trade by breaking geographical barriers and simplifying transactions. For intra-African trade, these technologies offer immense potential to enhance market access, streamline processes, and foster economic integration. The scope of bibliometric analysis was limited to the Dimensions Database. Databases such as Web of Science and Scopus will be considered for future research activities.

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