CHAPTER 6

Africa and India in the Global South: Leveraging Technological Innovations

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Introduction

Studies on African descent show that W. E. B. Du Bois of the United States and Kwame Nkrumah of Ghana were central in the establishment of the global coalitions of the NAM at the Belgrade Conference of 1961 and the G77 during the first UN Conference on Trade and Development in Geneva in 1964. These formations evidenced an embracing of Pan-Africanism and Afro-Asian solidarity (Assié-Lumumba 2015). The Second World War amplified the quest for an alternative to the dominant 'bipolar system' in the sustenance of peace. The Africans and Asians joined forces strategically to break the 'yoke' of colonialism and imperialism. This suggested that non-alignment emerged as a foreign policy position among many countries in the developing world, especially Africa during the post-Cold War era.

Africa in the twenty-first century attracted external interests from new players, the most significant being Gulf states such as the United Arab Emirates. Certainly, such advances signalled that African states needed more political, economic and diplomatic options for balancing the influence and power of the West. From the outset, Africa engaged in forming NAM to advance and project its interests in world affairs. Africa established the G77 group of countries within the larger United Nations (UN) to approach shared problems through reciprocal solidarity. Through the NAM and G77, the South–South alliance pushed for major reforms in global governance, and new international economic orders. Nonetheless,

the changing world order contributed to increased dependency on alliances created to advance and protect the interests of countries globally. Africa's current history of being exploited, victimised, marginalised and silenced is what placed it at the periphery of global politics. Intensified globalisation is also to blame for increased exploitation, downgrading and isolation of Africa's people from spheres of development. New partnerships should move beyond resource nationalism and instead embrace an exchange of 'resources-for-technology', with major powers like India and China, to reduce over-dependency.

Go's (2020) analysis of the metropole–colony relationship indicates that Africa's contemporary history of marginalisation, exploitation, victimisation and being silenced explains its position at the periphery of global politics. The colonial past is behind the continent's portrayal as an impassive and minor player with regard to the changes in global politics (Mabera 2019). Africa's agency is exemplified by its fight for political and economic independence in the post-World War period. African agency is considered by African leaders as the key to the execution of policies in diverse areas of governance, regionalism/regional integration, security, migration, health and the environment. However, studies of African agency have historically been framed within mainstream IR, rather than within the more recent global IR approach, partly because scholars differ on how they define and interpret 'agency' (Acharya 2016). Numerous scholars critique conventional approaches to the chapter and practice of international politics, citing the fundamental problem of the discipline to be its lack of inclusivity of Global South perspectives. In seeking to elucidate why some countries adopt opposing ideologies, this chapter argues that a country's stance is dependent on findings from other scholars, due to their significance on institutional factors such as democracy, economic openness and left–right positioning. Africa's philosophy has roots in political and socio-economic development and emanates from reactions to colonial and neo-colonial experience. This study is anchored in dependency theory because of its advocacy for collective, self-reliant and self-sustaining economic development in Africa. Nevertheless, practically, these aspirations have not produced the intended outcomes, a gap that this study seeks to explain through English

School theory. Africa can leverage the Pan-Africanism philosophy, which is an intellectual movement that calls for African countries to unite for freedom and prosperity. Alliances have been instrumental in amplifying Africa's voice and projecting African values and diplomacy to reflect the continent's concerns at the global level. These enable Africa to navigate through the complexities of the binaries on how other actors perceive the location of Africa in relation to how Africa desires to, or actually does, locate itself in the power shifts and fixes within the Global South.

Ontologically, African community beliefs and value systems emphasise the supremacy of the community within which the individual exists. Conversely, African belief and value systems naturally allow the individual and the community to be interdependent. However, this does not reduce the ontological density or the primacy of the community. The African context of epistemology is that an individual does not have enough capacity to acquire knowledge alone; they do so within a social context (Ani 2013). In relation to the power dimension, this chapter explores Africa and India as emerging major powers in the world. As Africa's strategic importance increases, India has leveraged the global trust deficit in Africa [?] and is now the trusted mouthpiece on Global South affairs. India leveraged its economic muscle and political influence in increasing the Global South's voice. India's avoidance of great-power rivalry and pursuing of an independent path resonated with the African states, who suffered under the West's dominance and double standards on matters of debt, climate, sanctions and war. The African Union (AU) and the Regional Economic Communities (RECs) need to overcome shared challenges with a view to finding a common voice in the global sphere.

The NAM and G77 are the second-largest groupings after the UN, and Uganda's assumption of the chairmanship offers a great opportunity. Africa stands to gain from the following strategies: leveraging advancing science and technology to improve its manufacturing; addressing the current problems facing the globe, such as environment, crime and terrorism; strengthening the African Continental Free Trade Area (AfCFTA) for strategic business; reinforcing of the NAM and G77 to influence decisions at the United Nations Security Council (UNSC); and, lastly, building consensus and priorities favourable to the developing

nations by maintaining unity, solidarity and collective coordination of all Member States. Since the formation of the NAM and G77 through declarations made by 77 countries, membership has grown to encompass 134 countries in the Global South (Makubalo et al. 2020). The AU actively used the NAM and G77 to make resolutions and create influence on all AU interests during negotiations at the United Nations General Assembly (UNGA) and the UNSC. Specifically, an 'alliance' of the AU, NAM and G77 is critical in handling core development matters such as the application of technology in agriculture; championing environmental sustainability and the UN's New International Economic Order; and passing resolutions that liberate Africa from colonisation (Zang 1998).

This chapter covers Africa in the larger Global South, before narrowing down to India to examine the technological opportunities that Africa could leverage in its quest to amplify its voice in the NAM and G77+China. This chapter proposes the need for African countries to adopt a 'united developmental ideological agenda' capable of speaking to their resources, including minerals and socio-economic development, in order to attain equal footing on international standing and ensure its voice is heard within the NAM and G77.

Background

Africa is undergoing profound transformations that have impacted on the lives of millions of people on the continent. Demographic growth, urbanisation, migration, technological development, digitalisation and structural economic and globalisation changes remain the most striking issues facing the continent in the 2020s, and likely extending into the 2030s. These changes depict an unpredictable world that demands the building of resilience for the planet's future. On the face of it, Africa's resilience is entirely dependent on its countries' capacity to harness innovation, as well as to create innovative development systems. Over the decades, the functionality of innovation systems has proved to be the foremost booster of economic growth and stimulus for employment creation in the Global North countries, including those in North America, Europe and some others in East Asia and Oceania.

Thus, the Global South, comprising Latin America, Africa, the Middle East and developing Asia, must put innovation systems at the forefront of its development strategies. Nevertheless, Schillo and Robinson (2017) contend that innovations potentially contributed to socio-economic inequalities. Nouck (2021) argues that China–India partnerships with Africa increased the likelihood of military clashes over resources – an issue that cannot be totally wished away. Chen (2018) summarised these by making three reflections: in the first scenario, natural resources come from foreign countries and the two trading countries have no direct influence nor overarching authority to completely prevent the other from accessing the resources; in the second scenario, the partnerships employ both smart and soft power in securing access to Africa's natural resources, and despite unequal capabilities and competition, cooperation proves to be inexpensive; and in the third scenario, awareness of the scarcity of resources, due in large part to the effects of globalisation and limited capacity to attain the best ecosystem globally. Pant (2020) argued that India's economy in the last three decades expanded exponentially due to the availability of nuclear power technology and a huge population driving labour demands. Conversely, the dawn of the Fourth Industrial Revolution, coupled with technological progression, lead to tremendous interest and leveraging of artificial intelligence (AI). Consequently, Global South countries are now capitalising on the opportunities presented to them by the rise of AI technologies, contrary to the earlier development of AI, which was entirely Western-oriented (Okolo 2023).

Historically, the 1955 Bandung Conference ultimately informed the evolution of South–South cooperation. This cooperation was aimed mainly at challenging the 'Norths' dominance over economic and political 'systems', however, the successes have not been without obstacles. This is imperatively because the conference contributed to the newly decolonised countries in the "global South" emphasising cultural and economic cooperation, human rights and fostering of global peace' (Appadorai 1955). According to Braveboy-Wagner et al. (2009), the emergence of 'Third World' solidarity defied the dominant colonial relationship thereby encouraging greater political, economic and diplomatic cooperation among Global South nations. The Bandung Conference also captured

policies of non-interference and non-alignment, and the NAM established solidarity strategically to challenge the deepening world inequality and reduce political and economic dependence on the developed economies in the Global North.

The perpetual ties between India and Africa are traceable back to 1900 when Mohandas Karamchand Gandhi actively campaigned against colonial rule in Africa in his advocacy for fairness and equality. Gandhi asserted that 'trade between India and Africa comprised of ideas and services contrasting with Western colonial model, which emphasised on the exchange of finished goods for raw materials' (Mathews 1997). In comparison, the twenty-first century shows a turn of the 'story', as India–Africa relations move beyond 'ideas and services' to more pragmatic relations that are now focused on India's economic, political and security interests as well as responses to Africa's developmental needs. Currently, India offers not only a feasible model of economic growth that is acceptable across the developing world but has also become a role model for democratic consolidation and sustainability, which is a rare occurrence in the majority of postcolonial states (Varshney 2013).

India and Africa's historical, economic, political and cultural linkages are well known. India's role in fighting colonialism, neo-colonialism as well as apartheid is credited for strengthening these pledges. Over the past few decades, India and Africa experienced considerable economic developments that were amalgamated within the context of South–South cooperation (Chaturvedi et al. 2014). Again, India played a crucial role in the establishing of the NAM, the G77 and the UN system. Furthermore, the establishment of the UN Conference on Trade and Development (UNCTAD) in 1964, followed by the adoption of the New International Economic Order (NIEO) in 1974, reflects these aspirations. A further review of India's foreign policy towards Africa shows it has been fruitful. However, some analysts point out that, despite Indian Prime Minister Narendra Modi actively linking foreign policy to national economic plans, there has also been a 'lack of strategic approach to Africa', a matter that means India loses out on certain key economic opportunities whilst relinquishing the space to rival countries such as China (Trigunayat 2019).

Studies depict significant changes to the economic relationship between India and Africa, with bilateral trade having increased from approximately US$5,5 billion in 2001–2002 to around US$70 billion (about US$220 per person in the US) in 2018–2019. However, the period 2014–2015 saw a peak of approximately US$72 billion in trade. The increase in trade was activated by the designing and developing of policies such as the Focus Africa programme initiated by the Indian government in 2002. This programme focused on improving trade and investment relations with the African continent. The India–Africa Summit initiative, launched in 2008, also created an avenue for Duty-Free Tariff Preferences (DFTP) for Least Developed Countries (LDCs), which played an instrumental role in boosting bilateral trade. Since then, the scheme has grown to account for 98 per cent of India's tariff lines and is presently active in more than 38 African nations which are direct beneficiaries of the DFTP scheme. Nevertheless, the tremendous growth in trade has been highly concentrated on a finite number of products and services, as roughly three quarters of Africa's exports to India are in the form of primary commodities and natural resources. Correspondingly, India's exports of pharmaceuticals and refined petroleum products to Africa account for 40 per cent (Afreximbank 2018). India's exports to Africa increased exponentially, with West Africa becoming the largest recipient and the region's exports falling significantly, by US$4,45 billion. The same trend was witnessed in 2023–2024, with India's exports increasing within the Southern African Customs Union (SACU) and the East African Community (EAC) countries (Biswas 2024).

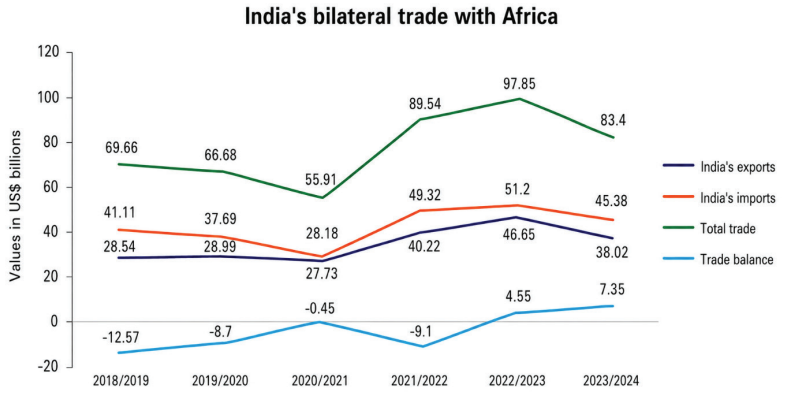


Figure 6.1: India's bilateral trade with Africa (2018–2024). Source: Ministry of Commerce and Industry, Government of India.

Against this backdrop, this study broadly focuses on examining how Africa and India can use technological innovations to leverage optimally on each other within the Global South. This chapter seeks to provide answers to the following specific questions: how do trade and investment linkages influence India–Africa relations in the Global South? In what ways do the BRICS impact India–Africa collaboration in the Global South? What aspects of technological innovations promote peace, security and development between India and Africa? What are the mainstream areas of technological transfer between Africa and India? What are some of the shared opportunities and challenges for Africa and India? What specific strategies can Africa employ to leverage India's technological advancement? This chapter also offers comprehensive recommendations.

Theoretical Foundation

This chapter adopts Bull's English School theory (Bull 1977) because of its potential to examine African agency through the lenses of the international system, international society and world society. The choice of the theory is due to its capacity to champion Africa's agency through strengthening institutions. This study finds the theory as being

suitable to examine India and Africa in the Global South because of its underpinning of collaboration, which is anchored on the liberal tenet of cooperation, thus allowing the duo to enter into mutual agreement on matters of technological exchange, trade and investment, climate change, peace, security and development. The theory's emphasis on the absence of a world government also helps explain why India and Africa seek to collaborate in order to leverage technological power and amplify their voices. This theory suits the debate because the creation of a 'world society' is aided by having a better understanding of each other's diverse cultures, particularly when they are to leverage from each other.

Research Design

This chapter employs secondary sources of data that include desktop reviews of existing literature from journals, articles and e-books. The chapter also uses authentic search engines.

Trade and investment linkages between India and Africa

Bhagwati and Srinivasan (2002), examining the impact of free trade on poverty in relation to the availability of resources and technology, claimed that, from a static point of view, having plentiful resources was likely to increase income in a country through opening that country up to trade. Nevertheless, by considering the abundant factor in the developing nations, Stopler-Samuelson's (1941) theorem of 'unskilled labour' contends that unskilled labour has greater opportunity to gain from 'trade openness' among developing countries (Abizadeh and Tosun 2007). On the contrary, Krueger (1984) suggests that any significant trade reforms among developing countries must be pro-poor, as this increases a country's likelihood of gaining comparative advantage through producing goods that require unskilled labour. Conversely, in order for comparative advantage to increase the earnings of the unskilled workers, they need to have the capacity to change from contracting sectors to more expansionary ones. Even so, cross-country regression studies on economic growth have produced mixed evidence. Relying either on trade

shares or guides on trade freedoms, Sachs and Warner (1995) note there is a positive correlation between growth and trade liberalisation. The African continent, with more than a quarter of UN member countries, has a significant voice in global trade. Arguably, the continent's growing geopolitical importance places it squarely within India's trade-promotion priorities. This has the implication that Africa's oil and mineral resources are significantly important both to the rapidly expanding Indian economy and for developing Africa's consumer and capital markets. According to Desai (2010), having a huge Indian diaspora on the African continent manifests the significance of foreign policy in enhancing trade between India and Africa.

Dramatic trends in South–South economic relationships are also manifesting transformations from the conventional patterns of economic development. This is predominantly evident in Asia–Africa trade and investment flows. Broadman (2006) points out that these economic associations contributed to both actual opportunities and challenges for African countries. On the other hand, a more careful diagnosis of Africa's relations with India and China indicates that the opportunities stimulated by both countries on trade and investment in Africa do not necessarily lead to improved growth and reduction of poverty in Africa. Moreover, the chapter notes that the quantity of trade and investment flows is not the main determinant; growth is better judged by the quality of the greater commercial relationships and how they influence these flows. Currently, India is Africa's third-largest trade partner, after the European Union (EU) and China. The largest export categories to Africa include finished petroleum and pharmaceutical products, cars and car parts, electrical and industrial machinery, whilst the largest share of India's imports from Africa is mainly raw materials, such as crude oil from Nigeria. Conversely, India has a large coal reserve, but it is a net importer of gas and oil – a situation that forced it to explore external markets with the express purpose of securing the energy it needs for sustainable domestic growth.

Simultaneously, there have been significant trade flows between Asia and Africa, which is a major boost to the continents' trade performance. Specifically, this growth is largely driven by economic complementarities between the two regions. Africa has increased its demand for Asia's

finished products and machinery, while Asia's demand for Africa's natural resources is rapidly increasing, particularly for labour-intensive products. The Confederation of Indian Industry (CII 2018) report *India–Africa and Investment* showed that mutual trade between the two regions increased remarkably – from US$7,2 billion (about US$22 per person in the US) in 2001 to US$62 billion (about US$190 per person in the US) in 2018, which is a demonstration of considerable growth within a relatively short period. One of the cited reasons for such growth has been Indian lines of credit, which have been extended to African countries largely through the Export-Import Bank of India (EXIM Bank), the institution that finances numerous infrastructural projects across Africa. A similar report by India's Ministry of External Affairs, titled *Lines of Credit to African Countries in 2019*, illustrated some examples of projects, including the Kampala–Entebbe Expressway in Uganda, Construction of the National Assembly building in Gambia, and the construction of the Mahatma Gandhi International Convention Center in Niger (Kharwal 2023).

The impact of BRICS on India-Africa collaboration in the Global South

BRICS represents the emerging economies of Brazil, Russia, India, China and South Africa. The term BRIC was originally coined by Goldman Sachs economist Jim O'Neill in his 2001 report titled *Building Better Global Economic BRICs* (Khanduri 2025). BRICS is an informal intergovernmental grouping whose strategic cooperation is based on individual economic and geopolitical strategies. Marc and Falkenberg (2024) observes that, besides having increased economic power, BRICS has now expanded to include countries such as Iran, Saudi Arabia, Ethiopia and Egypt. The inclusion of two additional African states in BRICS has heightened expectations about the continent's potential role in the evolving global order (Khumalo 2023). Cheru (2020) perceives the emergence of BRICS, as well as other emerging economies such as India, as being more of an opportunity for the African continent than a threat. He argues that the rise of such powers presents new opportunities for the African countries to gain greater autonomy over their development and gain independent economic policies that are free

of the conditionalities originally linked to aid from Western donors.

India and Africa play a critical role in influencing BRICS dynamics, particularly in advancing the agenda of a more inclusive world order. India, as the world's largest democracy and a major emerging economy, prioritises geopolitical strategic positioning and a shared commitment with African countries to transforming major institutions such as the UNSC. India's engagement in BRICS manifests its desire for global leadership and its means for navigating the complexities of the existing power dynamics (Kamalakar 2024). Alden and Aran (2017) argue that South Africa's entry into BRICS as the first African country added a continental dimension which remains significant in addressing issues such as sustainable development, poverty reduction and the enhancement of investment and trade flows. This partnership has contributed to increased collaboration on infrastructure development, renewable energy and education between India and Africa, and it has underscored the broader South–South cooperation within BRICS, which pushes for a multipolar world order that defies Western-power dominance. However, Monyae and Ndzendze (2021) argue that BRICS acted as a competitor to the existing international order and regional systems. On the contrary, India's huge political interest in Africa depicts competition with China in accessing African markets as well as natural resources for feeding its energy-security sector and expanding its diplomatic impact for promotion of cooperation towards development (Cheru and Obi 2011). With an estimated 1,4 billion people, Africa boasts of increased spending levels that make it potentially profitable and attractive for foreign direct investment and exports of finished products (Cheru and Obi 2011: 92). The BRICS expansion to include extra African countries could disadvantage South Africa over countries with larger economies such as China and India due to diverse interests – and because the most powerful countries stand to expand their influence over the rest. Arapova and Lissovolik (2022) argue that, although BRICS expansion opens opportunities for BRICS members, economic and financial sanctions imposed by Western powers may diminish BRICS's capacity to be the voice of the Global South nations.

Peace, security and technology aspects between India and Africa

Studies reveal a substantial gap in the research on correlation between innovative technologies and their role in fostering development among countries (Wang et al. 2023). India has actively cultivated closer relations with African states in the spheres of defence and security. The global security environment is rapidly changing with the rise of new security threats such as transnational organised crime and 'blue crimes' such as piracy, illegal fishing and smuggling. Battling such security threats demands collaborative efforts between India and African countries (Mishra 2023).

The emergence of technologies provides new opportunities in the areas of peace, security and development, particularly in peace operations, peacebuilding and the prevention of conflicts. The use of new technologies played a significant role in collecting intelligent information on crimes, creating early warning systems and response mechanisms (Uwa and Ronke 2023). Conspicuously, deployment of peacekeepers occurs in highly dangerous and challenging environments and, consequently, the majority of peacekeepers are often susceptible due to being under-equipped, pointing to significant gaps in relation to equipment and training. The Brahimi report (United Nations 2000) suggests that peacekeeping missions are likely to benefit hugely from the use of technological innovations. India's launch of the technological platform dubbed 'UNITE AWARE', in collaboration with the UN, is instrumental in providing intelligent information to peacekeepers in remote areas and in ensuring their safety and security (Nzioki 2020). The same is echoed in the UN Expert Panel on Technology and Innovation Report *Performance Peacekeeping* (United Nations, 2015), which argues that peacekeeping must be supported technologically to meet the current complexities and successfully lead to peace (Bratt 1997). Certainly, while other parts of the world, such as Asia, Europe and North America were embracing the Fourth Industrial Revolution, other regions in the African continent were playing a catch-up game, and with a glaring digital divide. This is happening despite Africa showing the largest internet consumption. Nevertheless, relying on 2017 data, the rate of penetration

within the Southern African Development Community (SADC) is higher (by approximately 26 percentage points than the continental average. Notably, the majority of emerging economies in Africa are still dependent on agriculture and extraction of natural resources and have not positioned themselves as major investment destinations for new technologies (Gillwald and Mothobi 2019). The diffusion of technology in LDCs such as Zambia depicts numerous challenges of uneven distribution and penetration (Kala 2023).

Tellidis (2020) contends that technological supremacy has been a key determinant in any matter of warfare and is thus an important factor when it comes to peace and war, since it serves as a mechanism for instilling discipline and control. Consequently, modern technologies offer opportunities for mutual cooperation on a global basis. The Independent Commission on Multilateralism (2017) contends that new technologies play a crucial role in supporting and promoting sustainable peace, security and development, and, as a result, it has gained acceptance within the UN. African countries have made tremendous progress in developing their technologies geared towards meeting their sustainable development challenges. However, India's experimentation with modern technologies for development places it in a position where African countries can benefit greatly by drawing lessons from its experiences (Bajpai et al. 2021). For instance, technological advancements in image-processing capabilities, satellite imaging as well as surveillance technologies remain critical tools that the UN stands to benefit from in its agenda for peace and security. In particular, during the UN mission in Sudan authorised under UNSC Resolution 1706 (2006), the UN employed 'aerial reconnaissance' and other 'aerial' means to help safeguard and protect civilians (UN Security Council 2006). Similarly, the UN deployed drones to support the protection of refugees and internally displaced persons in Chad in 2009.

India's security engagement with Africa has centred on three main areas: intensified participation in UN peacekeeping operations in protracted African conflict zones; cooperation on counter-terrorism and maritime security; and military collaboration through training initiatives. Between 2014 and 2015, India accounted for 80 per cent of the police officers (male and female) deployed as UN peacekeepers ('blue helmets')

across the African continent (Mukherjee 2015). Historically, India maintained only limited military-to-military relations with African states during the apartheid era in South Africa. More recently, however, India has demonstrated a clear commitment to supporting Sahel governments through funding and training aimed at combating violent extremism. As African economies undergo significant transitions, they warrant a far greater share of India's strategic attention.

Compared to India, Africa is less dependent on resources, with manufacturing being at the core of the growth in African economies. India's private sector, coupled with its rich human resource pool, stands to benefit from the African countries currently undergoing transitions in their economies – mostly those from East and Southern Africa, such as South Africa, Kenya and Mozambique, and West African states like Ghana (Passi and Guennoun 2018). Despite India's continued engagement with the African continent, the relationship has yielded little achievement. However, Prime Minister Modi's 2018 articulation of 'Ten Guiding Principles for India–Africa Engagement' helped reinvigorate relations with several African countries, with a particular emphasis on technology, industry, security, intelligence cooperation and financial inclusion. Tirziu (2021) argues that India's ties with Zambia were centred on defence cooperation and anti-terrorism. In this case, India considers the fight against terrorism a common fight destined to create a fairer representation of developing countries in international organisations.

The mainstream areas for technological transfer between Africa and India

Developing nations in Southeast Asia became the first to show the impact of technology on agricultural yields. Pingali and Abraham (2022) argue that Asia's transformation from a food-deficient continent to a self-sufficient one, and its attaining of exporter status, is an important example. Nevertheless, it is crucial to note that the Green Revolution is widely recognised as having ushered in a monumental shift in eliminating famine in Asia. To be precise, between 1900 and 1969, famine claimed more than 80,3 million lives, whereas between 1970 and 2016 the

mortality rate resulting from lack of food reduced to 9,2 million. Evenson and Gollin (2003) argue that crop-breeding innovations were instrumental in reducing food insecurity globally over the past 100 years. The Green Revolution introduced high-yielding varieties (HYVs) of major grains such as rice, wheat and maize, alongside mechanisation and increased use of fertilisers and other inputs. Together, these innovations helped build more resilient food systems capable of supporting rapidly growing populations in parts of Asia and Latin America (Pingali 2012). Consequently, the higher yields contributed to increased food availability, reductions in prices and improved household incomes, and to a large extent contributed to a reduction in hunger and poverty in developing nations (Eicher and Staatz 1998). According to Balogun (2022), subsistence farming – which accounts for a third of the world's food – continued to face challenges of limited land for farming due to population pressure, and price and income volatility due to changes in agricultural policies, poverty, climate change, complex food systems and biophysical challenges such as disease and pest outbreaks, soil infertility and land degradation.

India today joins the league of large-scale purchasers of African farmland, and is criticised for 'land grabbing' alongside countries such as Kuwait, China, Saudi Arabia and South Korea, who are all investing heavily in agricultural production in Africa. Declining groundwater levels and India's long-term strategic concerns have encouraged the country to invest in agricultural production abroad, particularly in parts of Africa, as one component of its broader food-security strategy. Conversely, developing nations are strategically courting Indian agricultural investors through special incentives such as huge tracts of arable land at relatively cheaper cost. At the same time, the Indian government is continuously supporting this trend through trade diplomacy, foreign assistance and the issuing of subsidised credits to its external agricultural producers (Rowden 2011). However, this trend has been criticised for negative effects on local communities, including the internally displaced persons (De Schutter 2011). For instance, the disclosure of lease contracts between the Ethiopian Government and five Indian companies demonstrates some of the political, ethical, environmental and human rights ramifications

for local communities in host countries (Girmay and Nekemet 2021). Some of the agricultural technology adopted in African countries has included uses in farming of cocoa in Cote d'Ivoire and Ghana, flowers in Ethiopia and Kenya, and cassava farming in Nigeria. Rawat (2020) associates the lack of adoption of new agricultural technologies in many African countries to low investment in research and development compared to South Asia. Gulati and Das (2020) trace India–Africa agricultural cooperation through initiatives such as training programmes and concessional credit, particularly in areas like mechanised farming, soil-quality testing, irrigation and conservation.

There is also a growing emphasis on climate-smart agriculture (CSA) in Asia, driven in part by increased financing from the Asian Development Bank (ADB). Comparable efforts in East and Southern Africa are being advanced through the New Partnership for Africa's Development (NEPAD), which aims to reach 25 million households with CSA practices by 2025 (Aggarwal et al. 2017). The use of CSA boosts sustainability of agricultural productivity by creating adaptation and resilience, lowering and eliminating emission of greenhouse gases, contributing to food security, and the realisation of national development goals (Palombi and Sessa 2013). On the other hand, agricultural digitalisation enhances productivity, efficiency, food security and sustainability through soil protection, conserving of biodiversity, and human health (Macpherson et al. 2022).

Digitalisation leverages the Internet of Things (IoT), drones, sensors, robotics, cloud computing, AI, decision-support software (DSS), information and communication technologies (ICT) and block chain to enhance agricultural production and value-chain processes within food systems (Klerkx 2021). In addition, mobile-based initiatives such as SMS services and mobile applications are being promoted in many countries by governments, NGOs and private-sector actors, working either individually or in partnership (Sentilkumar 2013). Classical examples include India's Digital Green, Ghana's Esoko and Uganda's AgriNet, all of which provide digital solutions to farmers through good-agricultural-practice advisories, market-linkage information and weather forecasts (Nyarko and Kozári 2021). Thus, digitalisation of agriculture has encouraged a

revolution that has the potential to respond to the increasing needs of the growing population based on the prevailing economic and environmental challenges (Trendov et al. 2019).

Indeed, improving productivity, sustainability and profitability of the agri-food system in Africa is critical to the region's economic development, food security and nutrition. Agriculture in sub-Saharan Africa makes up approximately 15 per cent of GDP, with evidence indicating that a 1 per cent increase in GDP potentially reduces poverty by more than 1 per cent on average. Similarly, a 1 per cent increase in industry or services GDP is associated with a reduction in poverty levels of just over 0,5 per cent (Kim and Shah et al. 2020). Africa needs to leverage India's technological tools to become more productive and efficient, and to build resilience within its agri-food systems. Through the adoption of disruptive agricultural technologies (DATs), African countries can lower the costs emanating from linkages between buyers and sellers, thus reducing difficulties in accessing information, technologies and markets. This could also aid farmers in quick decision-making on resource mobilisation and management through the provision, processing and analysing of data quickly. It could also reduce economies of scale. Regarding Uganda, New Delhi is aiming at investing in energy infrastructure and agricultural technology. In the actual sense, India adopted a diversified approach towards Africa, and today it is more trusted than China across industries (Cheru and Obi 2010). Conversely, India is dependent on African states for its economic development, and for its global and regional ambitions. More evidently, Africa and India exchanges on technological matters (tech hubs) enhance greater African agency and boost African start-ups through integrated learning and investments. Perhaps this is an opportunity for creating markets for India's tech products and services.

Technological exchange in the healthcare sector

Passi and Guennoun (2018) maintain that Africa and India share numerous commonalities that go beyond socio-demographic profiles to also capture healthcare challenges. While the African continent comprises independent nation-states, India consists of a federated union of states.

Markedly, both India and Africa have experienced increased adoption of digital health platforms. However, India's continuous concerted effort, particularly around innovating its healthcare, has gained recognition worldwide. Future Health Index Report (2019) published by Royal Philips show that India achieved global leader status in health technology, and is thus regarded as one of the leading countries in terms of adoption of digital health technology, as 76 per cent of India's healthcare professionals are currently using digital health records (DHRs) in their work (Mathur and Philips 2019).

In comparison, the embracing of technology in the delivery of healthcare services in most African countries is still at the initiation stages. While some countries, such as South Africa, Kenya and Rwanda, were adopting digital technologies, the majority were still lagging. Mechael and Edelman (2019) suggest that Africa lags in the global average of attaining maturity. This insinuates a desire for the African countries to design and implement sustainable interventions geared towards meeting citizens' healthcare needs. Evidently, India and Africa share commonalities on healthcare challenges, and Africa can learn from India's affordable healthcare interventions. In this case, Africa has the potential of leveraging on technology to strengthen its healthcare systems infrastructure through learning and applying the successful Indian technologies.

Chataway et al. (2009) argue that science, technology and innovation are crucial for alleviating poverty and improving health. Indeed, enhancing access to quality healthcare together with existing health technologies is indispensable. However, the importing of technologies and products does not guarantee sustainable healthcare systems. Moreover, nations are required to build their own capacities and institutions that support innovations tailored to citizens' needs. Conversely, the challenge of having advanced technology and innovation is contingent on the policy-maker's capacity to deal with issues systematically and build innovative systems that facilitate, foster and respond to developments. Accordingly, an article in *Nature Biotechnology* made a compelling case for building innovative health systems among developing countries, arguing that this is crucial for building health systems that reflect the needs of the developing nations (Thorsteinsdottir et al. 2004). Certainly, manufacturing and innovative

capacity among countries such as India, Brazil, Cuba, South Africa, China and South Korea have contributed significantly to increased research and product development for diseases affecting Asia, Latin America and Africa.

Relatedly, telemedicine initiatives represent a key health-ICT intervention from which sub-Saharan Africa can learn. Both regions face acute shortages of medical specialists – such as cardiologists, radiologists, paediatricians and oncopathologists – largely because these experts are concentrated in urban centres, leaving rural areas underserved. In India, for example, around 68 per cent of the population lives in rural areas that experience severe shortages of qualified doctors and healthcare professionals (Mathur 2017). In comparison, sub-Saharan Africa has an average of not more than 10 doctors per population of 100 000 people, with 14 countries lacking radiologists, according to Fraser (2000). Telemedicine is a critical component that can help India and Africa increase accessibility in remote areas. Conversely, the African continent's significance has grown in the world energy markets as a result of West Asia's instability. Consequently, technological advances have created an avenue for extracting Africa's offshore oil reserves and making the continent the most favoured destination for the majority of Indian companies. Mohanty and Chaturvedi (2008) point out that the establishment of the Group of Twenty (G20) marked the climax of South African and Indian efforts towards strengthening their relations ever since the World Trade Organization's (WTO's) Seattle meeting in 1999.

Africa, like other continents, has embraced the so-called Fourth Industrial Revolution. A good example is the use of drones in healthcare, particularly in delivering blood in remote areas, as is happening in Rwanda. This provides a large contribution to the security of its citizens. Other Africa countries are engaging in technological research and development, with Ethiopia and Nigeria thriving with regard to AI hubs (Razakamaharavo 2021). As India continues to advance its capacities in technologies such as satellite communications and AI, this creates strong opportunities for partnering with African countries such as Kenya, Ethiopia, Ghana, Rwanda, Nigeria and South Africa, who have already launched satellites into the skies, and also with other African countries currently lacking such

technologies. These developments have the potential to attract the US as an ally of India and African countries in the race for space technology – an area in which China is also keen on advancing its presence.

Opportunities for both Africa and India in the Global South

Some African countries, such as Namibia and Niger, who are both signatories to the Non-Proliferation Treaty (NPT) since 1992 possess important uranium reserves, which present opportunities for India's strategic interests in resource and energy security partnerships (Ramachandran 2008). In this case, India's interests in Africa are not merely related to oil and gas, but the availability of minerals such as uranium. According to Pham (2007), India's strategy is centred on the pursuit of resources, trade opportunities, diplomatic initiatives and strategic partnerships. Plausibly, these factors explain the rising investments, trade and development aid partnerships that India is crafting with African countries. Madan (2006) estimates that by 2030 India will be the world's third-largest consumer of energy, overtaking Russia and Japan. Currently, India's oil needs account for 75 per cent of its energy supply requirements, with its dependence on oil projected to go above 90 per cent by 2020. Undeniably, Africa–South cooperation is significant in designing strategies for addressing the rising socio-economic challenges Africa faces. Such cooperation offers an opportunity for African countries to create technological change, transformation in their economies, and a foundation for sustainable growth.

According to Ferdowsi (2010), Africa's involvement in South–South collaboration offers an opportunity to increase not only its representation in the globe's economic and political arena but also augments its share of the international economy. Shared concerns are conspicuous in the areas of good governance, debt management and environmental sustainability on the continent. Additionally, Africa's attainment of long-term impact greatly depends on its capacity to exploit the full benefits of cooperation and diminish potential risks. Nonetheless, the realisation of a long-term development framework 'Vision 2030' holds a huge promise for Africa–India relations, since both countries value the

mutual benefits emanating from having deeper economic collaboration. Clearly, a strong Indian economy and stronger emerging markets across Africa offer substantial trade and investment opportunities. Africa's Agenda 2063 and India's Act East policy also exhibit important areas of convergence, making their partnership geopolitically significant. Equally, the country and the continent standing together offers a better chance of influencing governance at global level, including peacekeeping and climate change negotiations. The *African Trade Report* (2018) argues that the establishment of the AfCFTA places the continent in a strategic position, because it is now a vehicle for improving trade and helping in the transformation of African economies by ensuring value addition and reducing dependence on external commodities. The AfCFTA represents a significant opportunity for boosting Africa's development. Zucca (2023) argues that the AU's Agenda 2063 has the potential to accelerate intra-African trade, increasing the continents' trading position in the global market by reinforcing Africa's shared voice and policy space in international business negotiations.

India has been instrumental in taking bold steps towards strengthening its research and development through the development of innovative technologies and by changing its people's mindset towards utilising modern technology. There are now a large number of scientists and engineers working in research and development who are making India the 'hub of innovation', as the country has inculcated innovation in higher learning, thereby creating sustainable human capital. India, which is home to more than 100 multinational corporations, has consistently deepened its technological innovation capabilities, and it is now forming alliances with international corporations that are destined to reap numerous benefits due to linkages among local companies, universities and multinationals worldwide (Dahlman and Utz 2005).

Challenges facing India and Africa in the Global South

India has just 0,4 per cent of the world's oil reserves and, with only insignificant oil discoveries since the 1970s, it leads the list of countries that depend on imports of oil commodities. Conversely, Africa's weak

capacity prevented it from exerting meaningful influence in the economic world order despite its leaders' desire for increased negotiating power in international spaces. Another striking challenge in achieving India–Africa collaboration on infrastructural development has been inadequate funding and timely implementation of projects. Evidence from both Africa and India shows that numerous projects face delays and cost overruns (Gurara et al. 2018). Also, there is a lack of long-term maintenance and quality assurance, which often creates inefficiencies and shortens the project's lifespan (Kharwal 2023). A different study focusing on the digital divide and development in sub-Saharan Africa found a challenge in establishing whether the digital divide was expanding or narrowing down, but noted tremendous progress on infrastructure development and mobile connectivity, which could lead to bridging of the digital divide (Mutula 2008). Moreover, an analysis of the digital divide in India shows ICT infrastructure as the backbone and enabler of change and reform, as it attracted minimal resistance, with Singh (2010) suggesting that good governance only thrives where there is better ICT. However, despite India investing in ICT infrastructure to transform all its diverse cultural divides, Guillen (2006) argues that India remains the country in the developing world experiencing the greatest digital divide between rural and urban residents. Therefore, this problem demands to be understood through the lenses of mobile-phone penetration, tele density and internet access, which together shape the rural–urban digital divide in India.

Best practices as opportunities for addressing Africa's technological gaps

Africa needs to diversify trade beyond conventional sectors for it to promote balanced and sustainable development across the continent. Creating initiatives such as the India–Africa Forum Summit is critical to expanding its economic relations. Again, infrastructure remains one of the key priority areas, and Africa needs to critically address its transportation systems, energy and digital connectivity by generating continued funding through Indian lines of credit to guarantee timely implementation of the projects. Additionally, Africa needs to focus

on human resource development through training programmes, scholarships and technological transfer to empower African countries, and this is achievable by aligning itself with the African Development Bank's goals of educational transformation. Observably, Africa lags in terms of healthcare. Thus, prioritising technological transfer and affordable universal healthcare solutions is critical for the continent to be able to leverage India's outstanding experience. Clearly, partnerships in e-commerce governance and cybersecurity between India and Africa are fundamental. Similarly, Africa committing to green technologies, renewable energies and sustainable practices that are aligned with the UN's Sustainable Development Goals (SDGs) is key to harnessing new technologies.

Consequently, Africa needs to engage India from a more robust and better-informed position in order to implement its strategies at national, sub-regional and continental level with full involvement from domestic actors, civil society organisations and non-governmental actors (Acharya and Johnston 2007: 10). According to Söderbaum and Taylor (2008), achieving regional development in Africa today requires a multifaceted approach that encompasses all stakeholders, rather than relying on ineffective intergovernmental negotiations. This would also counter and reduce the ill effects emanating from Indian and Chinese penetration into African markets. Existing literature highlights the need for pro-poor and inclusive-growth policies if Africa is to secure meaningful and strategic forms of collaboration. It also underscores the importance of stable macro-economic policies that reduce inflation and fiscal deficits – conditions essential for countries to achieve sustained growth by fully utilising production capacity. Equally important is the stimulation of domestic capital formation, which remains a critical missing link in many African economies. Additionally, African countries can draw more effectively on their diasporas in countries such as India, China and South Africa to meet social, human and financial needs and to support broader economic development. More fundamentally, the continent needs to shift from a production structure dominated by low-value primary commodities to one centred on higher-value-added activities. Achieving this requires strategies that leverage the diaspora's skills, networks and investment

potential, rather than relying almost exclusively on remittances. Chand (2016) postulates that developing a friendlier diaspora policy could enhance Indian and African economic development.

Africa-specific recommendations

1. Africa should ensure diversification of trade beyond conventional sectors in order to promote balanced and sustainable development across the continent.
2. Africa should focus on human resource development through training programmes, scholarships and technological transfer to empower African countries.
3. This study suggests partnerships in e-commerce-governance and cybersecurity are instrumental. African countries committing to green technologies, renewable energies and sustainable practices in line with the SDGs plays a fundamental role in strategic African gains by harnessing new technologies.
4. Pro-poor policies are needed in order for Africa to secure meaningful and strategic collaborations that enable more stable macroeconomic policies that assist in reducing inflation and fiscal deficits.
5. African countries can involve their diasporas in industrialised countries such as India, China and South Africa in providing the high-demand social, human and financial capital needed to fuel economic development across the continent.
6. Lastly, India – often described as the largest democracy in the world – conducts national elections using electronic voting machines with more than 800 million registered voters, and results are declared in a fair, verifiable and credible manner. As a result, the country is peaceful enough for economic development to occur. This chapter recommends that, to help Africa amplify its voice within the NAM and G77+China, it needs to take lessons from India's democratic consolidation, because greater peace and security will help unlock economic development and achievement of the UN's SDGs.

India-specific recommendations

1. India should tap into renewable energy sources to complement its low or insignificant minerals such as oil and gas.
2. Through strengthening of digital infrastructure and connectivity, India would be better positioned to solve its digital divide problem, which would then strengthen its ability to take advantage of Africa's growing technology-user base.
3. Africa is lagging in relation to use of technology in healthcare and energy security. As a result, India could leverage growing needs in these sectors to sell its technology.

Conclusion

Pan-Africanism and Asian–African solidarity concepts are significant in explaining the historical ties between India and Africa. India is now the African continent's accepted mouthpiece, thanks to its use of its technological and economic muscle and political influence to amplify voices from Global South countries. In addition, the convergence of India's technological prowess and Africa's technological needs is manifested in emerging international challenges such as globalisation, terrorism, climate change, food insecurity, sophisticated peacekeeping operations and disease outbreaks. This chapter also notes the ideological challenges, inefficiencies in implementation of projects, lack of economic, social and human capital, lack of commitment to embrace policies for technological transfer, and the vast digital divide between India and Africa. These challenges highlight the complexities of the binaries on how other actors perceive the location of Africa vis-à-vis how Africa desires to, or actually does, locate itself in the power shifts and fixes within the Global South. However, technology-use gaps in Africa present a strong opportunity for India to leverage its technology strengths to tap into existing markets in the ongoing Green Revolution. Conversely, Africa stands to benefit from India's low oil reserves, which makes it almost entirely dependent on the continent's minerals. This study reveals that Africa's exports were comprised of only 14 per cent raw materials, while India's were

made up of 40 per cent finished products. Through importing of India's technologies, Africa stands to improve on value-addition, thus increasing its exports to India. The chapter highlights the role of technology in advancing climate-smart agriculture, an area in which both Africa and India must invest if they are to make meaningful progress towards the Sustainable Development Goals. It also shows that the growing exchange of technological knowledge between India and Africa aligns well with Hedley Bull's English School framework: India's use of technology to pursue strategic interests in Africa reflects the interplay between power, order and cooperation within international society. At the same time, the framework underscores collaboration as a central norm, providing a useful lens for understanding how technological transfer can help address Africa's energy, health and agricultural challenges.

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