

## Digital Services and Industrial Inclusion: Growing Africa's Technological Complexity

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The expansion of mobile services in Africa is heralded in popular narratives as an example of how the continent can leapfrog technologically—participating in the global economy through local dynamic and innovative enterprises. The disruption of landlines by mobile phones is at times described by researchers as technological leapfrogging, but without the associated industrial transformation (Aker and Mbiti 2010). In this short reflection, I argue that this focus limits the discussion on digital inclusion to the use of services. The challenge instead should be to expand economic inclusion through local industrial development.

The international expansion of Kenya's mobile money transfer system, M-Pesa, has been heralded as an example of what is possible, with the technological platform also being applied to other areas, such as energy, water, and sanitation. Some of the most transformative applications are in agriculture (Juma 2015). The promise, however, is misplaced because the mobile revolution has hardly been a stimulus for economic inclusion via industrial expansion. Africa still lags behind other regions of the world in manufacturing, and it has not made major steps to move to the production of mobile-related technologies. Doing so would help to broaden the base for economic inclusion beyond the core provision of telecommunications services.

As the M-Pesa example shows, the wide adoption of mobile phones in Africa has created remarkable enthusiasm for technology on the continent. It symbolizes the great potential that lies in technological catch-up, that is, by leapfrogging along the path blazed by South Korea to break out of the middle-income trap (Lee 2012). While inspirational, however, the mobile revolution appears to have had little effect on the industrial policies of

African countries, partly because of misinterpretation of what the revolution actually entailed.

Popular narratives of the mobile revolution focus on access devices and the services that the sector provides. The mobile handset, especially in the hands of ordinary Africans, has become the symbol of the revolution. There is a good basis for this imagery. The business model that made it possible for Africa to rapidly adopt mobile telephony involved the availability of low-cost handsets. What often goes unstated, however, is that the mobile revolution was fundamentally about telecommunications infrastructure (Batuo 2015). The spread of mobile phone towers across Africa is the outer manifestation of a complex engineering system that enables mobile communication.

Creating such a system involved reforming laws across Africa to create the entrepreneurial space for the new infrastructure (Ndemo 2016). The policy champions of this disruptive technology confronted many issues, including opposition from the existing landline industry (Juma 2016). But the public and private entrepreneurs introduced new business models—including prepayments and low-cost handsets—that enabled the poor to be included in the revolution.

The infrastructure revolution has also undergone dramatic changes. Early mobile phone systems were connected to the rest of the world via satellite links. Until 2009, only a small number of West African cities had access to undersea fiber optic cables. Today all of continental Africa and the Indian Ocean states have access to marine fiber optic cables with significantly higher bandwidth. Terrestrial connectivity is the latest investment frontier.

The challenge for many countries is how to leverage broadband infrastructure for economic transformation. In some countries, telecoms operators have yet to migrate from a reliance on satellite links to using fiber optics cables. As a result, the promise of low communication costs has yet to be realized. Even where the migration to fiber has occurred, access charges remain prohibitive. As a result, the infrastructure is not being fully utilized to foster innovation and development. This is not just a telecoms issue but indicates the lack of a complementary evolution in innovation policy.

There is great optimism over the emergence of information technology (IT) hubs in major urban areas across Africa (Adesina, Karuri-Sebina, and Resende-Santos 2016). These hubs have become a symbol of youth entrepreneurship in Africa. Indeed, many of them are producing new technologies designed to solve Africa's problems. But their appearance away from centers of research and learning also signals the need to foster more integrated innovation ecosystems that bring business, academia, and government together. The hubs have also exposed the need to improve the overall funding and policy environment for technology-based ventures.

The definition of mobile inclusion in Africa needs to broaden to cover industrial development. This includes the potential to manufacture devices, equipment, and infrastructure components. It also entails strengthening human capacity in the related engineering fields. This industrial expansion can be supported by linking industrial development directly to current efforts to grow African markets through regional integration (Mangeni and Juma, forthcoming).

Take the case of Taiwan. In the early 1960s, the country was a world leader in mushroom exports, a high-volume, low-value perishable commodity. Taiwan then took advantage of the emerging semiconductor industry to redefine itself as an industrial player. Taiwan's Industrial Technology Research Institute, which spawned many of its leading semiconductor firms, was created by consolidating four dilapidated research centers left behind by Japanese occupiers (Shih 2005). The case of Taiwan illustrates how a country can move from the initial use of existing technologies to generating increasingly diverse products through industrial policy. Many African countries have greater research capacity than Taiwan did when it entered the semiconductor field. The difference is that Taiwan viewed it as an opportunity for industrial growth, not just the provision of services.

An effective industrial policy will entail continuous interactions among government, industry, and academia. Many of the critical elements needed for this process to work are emerging. For example, several African countries have created higher education institutions to train new professionals for the digital sector, including new telecoms universities in Egypt, Kenya, and Ghana. The impetus for creating these institutions came from telecoms

rather than education ministries. Countries such as Ethiopia have started local assembly of mobile handsets. This could help widen the base for industrial development. The rise of IT hubs in African cities such as Nairobi and Lagos is another node in a potential industrial ecosystem based on mobile technology.

One of the key policy challenges is that shifting from mobile services to industrial development entails higher-level coordination. This involves facilitating interactions between ministries, higher research and technical institutions, and civil society actors in a wide range of sectors, including finance, telecommunications, industry, services, education, and marketing. This coordination will need to be pursued with the support of systematic science and innovation advice, which is often missing in African countries. At the very least, heads of state and government offices will need to be guided by the best available technical advice to incrementally forge industrial policy that is suited to the task.

On the whole, the key lessons from the mobile revolution are yet to be fully learned and implemented as a basis for inclusive industrial transformation. Until they are learned, the popular call for technological leapfrogging and the associated industrial development will remain a mirage. This situation is due to a failure to appreciate the scale and scope of the reforms needed to shift Africa from its current focus on users of services to a focus on contributors to the transformation of local industry.

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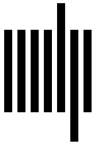
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