

OPINION PIECE

Emerging technologies and the future of African manufacturing

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African countries have, largely unsuccessfully, tried many approaches over the past 50 years to develop manufacturing. Despite this, the ambition remains. However, new and emerging technologies associated with the "new industrial revolution" (Marsh, 2012) will have to be mastered. These technologies include advanced automation (robots); additive manufacturing (3D printing); the Internet of Things (IoT); and perhaps most significantly, artificial intelligence (AI).

One of the largest manufacturing sub-sectors in Africa is food and beverages. Companies in this sector include giants such as SABMiller, Tiger Brands, East African Breweries and Nestlé Nigeria. Trends such as population growth, urbanization and the rise of the middle class are increasing the demand for more, better quality and more diversified food products. It is a huge opportunity for manufacturing.

Emerging technologies such as AI and 3D-printing can play a catalysing role. AI applications being implemented elsewhere are already contributing to improving food production from the "farm to the fork", for instance, by helping farmers to monitor growing conditions and to identify crop diseases timeously, by tracking products along the entire supply chain, by improving food-sorting and equipment-cleaning, by monitoring hygiene in factories, and by helping entrepreneurs develop new products. Blockchain, a new digital technology that creates trust between parties and reduces the need for intermediaries, can help in this by improving the functioning of financial and land markets.

3D printing is contributing to the "mass customization" of new food products, for example in the 3D printing of food items (e.g. confectionery). It will not only drive customization of products to more closely meet consumer needs, but may also democratize production and innovation. An example is the 3D4AgDev project that uses 3D printing to provide female African smallholder farmers with the technology to design and develop their own labour-saving agricultural tools, whereby local tool manufacturers (artisans, blacksmiths) can copy plastic prototypes and develop their own modifications (see also Naudé, 2017).

Boosting African industrialization through food processing will require drought-proofing agriculture, given that the continent is one of those worst affected by climate change. This is an opportunity for "green" industrialization and promotion of the circular economy. Diamandis and Kotler (2012) recognised that "Africa has nine times the solar potential of Europe and an annual equivalent to one hundred million tons of oil". With such considerable potential energy resources, the costs of electricity, one of the most vital inputs into manufacturing, should drop significantly in Africa in years to come.

How do African countries harness these opportunities? Yes, there is a digital divide and yes, Africa lags behind in terms of many indicators of participation in the digital economy. Yes, there may not at present be enough science, technology, engineering and mathematics skills available in local labour markets.

However, in the digital economy, leapfrogging is possible. Kenya is already a world leader in financial technology, or fintech (e.g. the mobile money transfer service M-Pesa). And new mobile technology is already being used to stream video lectures into African classrooms: there is nothing inevitable or permanent as far as the skills gap is concerned.

Africa needs to focus on four essential strategic areas: (i) high-speed internet access, (ii) electricity expansion, (iii) skills development, particularly entrepreneurship and management skills, and (iv) investing in smart cities. Cities are where manufacturing will grow. African cities should not lag behind the coming 5G mobile networks. The African Continental Free Trade Agreement (AfCTA) is important in all of the above to provide scale economies through regional coordination and integration.

It is wrong to argue that Africa should still be investing in traditional manufacturing sectors based on the idea that somehow this will give African countries the experience to "learn" how to industrialize. There is little opportunity in "old" industries where useful learning can occur in the age of disruptive digital manufacturing. In fact, it may only serve to lock certain countries into dead-end manufacturing sectors. What is far more sensible today is to invest in entrepreneurial ability. Africa has great entrepreneurs. Let's start now to build the start-up ecosystems that can generate the future giants of African (digital) manufacturing.