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# Hack, make, sell

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How to change the erroneous perception of Africa as technology backwater. Go look, for example, at what the "Maker Movement" is doing in Ghana and Nigeria.

“Do-it-yourself” (DIY) making is not a new phenomenon. However, the “Maker Movement” is increasingly more visible as key changes in digital manufacturing alongside a wider reception to open source technologies change individual production in new ways. Tools like 3D printers, compact laser cutters, Arduino and Raspberry Pi have enabled the creation of new spaces for designing, prototyping, and manufacturing on a smaller scale. Although hobbyists still dominate the ranks of makers worldwide, making is also increasingly seen as part of new entrepreneurial pathways, with many makers rising to the challenge to become entrepreneurs.

In Ghana and Nigeria, we have seen small but growing pockets of makers interested in using digital tools as a way of hacking daily life since Maker Faire Africa ceased its annual showcases in 2014. Among them are people who see making not just as a way of tinkering with things but also as a viable new way of producing valuable products for their local markets. Using WhatsApp and Facebook groups, as well as meetups in Accra, Kumasi, Lagos and elsewhere, these makers find each other and share strategies for building all manner of things. These groups are open and welcoming to makers of all levels of expertise and are used as a resource for makers to find materials, components, as well as to get support for projects.

Through our interactions with these makers, both online and in person, we find that they fall into three main groups: qualified engineers or those with some professional hardware training but working in a non-engineering/hardware job; hobbyists and tinkerers with no particular training but an interest that has led them to acquire new skills; and maker-entrepreneurs who have ideas to commercialize a hardware solution locally.

Many of our colleagues move from the first and second group to the third at some point. Due to the nature of STEM education in resource-strapped schools in both countries, several of these makers did not get as much hands-on experience as they would have liked and making provides them that opportunity.

The entrepreneurial aspect is important. Maker-entrepreneurs see making as a way to build solutions to everyday problems that they believe can be adapted at scale for their local context. Entrepreneurship is the path to commercialize and scale up their solutions so they are available to others. However, the market they work within presents some specific challenges that need sorting before this can happen.

Making is about turning ideas into actual things. If you're trying to produce something from scratch, getting that first prototype working is crucial. To do so, you need materials and components and this can scupper your project if you don't have easy affordable access to these things. Although there are local markets in Accra, Kumasi and Lagos, they often do not carry niche items like an M2.5 screw as these Nigerians shared. For more electronic projects, core items like microcontrollers are trickier to find.

Ordering online can be a headache. If buying from the U.S., your bank card is probably not accepted or your country is blocked (like Ghana is on PayPal at time of writing). If you are ordering from China, shipping can take a long time unless you pay for costly express service. Sometimes, the challenge is not finding the material itself, but the machinery to customize it to your needs. In the case of one Ghanaian maker, several plastic manufacturers in the country had the special kind of plastic he needed but they came in large industrial sizes without the machinery to customize several cuts to suit his design. Importing is not cheap and brings additional costs to projects.

Turning a project into a market viable product is essential for the maker-entrepreneur. Getting money for entrepreneurial ventures that are not tailored to retail, real estate, or other 'traditional' sectors is an uphill climb. Investors are very conservative and banks require collateral for loans with high interest rates. Currently there is no dedicated venture capital industry for hardware on the African continent; even in places such as Silicon Valley, most hardware startups fail.

So, if you are a maker in Ghana or Nigeria, how do you finance your project from the prototyping stage all the way through to market? Many maker-entrepreneurs bootstrap and use their savings or borrow from family and friends where possible. Some turn to digital platforms like Indiegogo, GoFundMe, Kiva, etc., but even there, you need to provide proof of concept or working prototype to get people to give money. And then of course, there are the platforms like Kickstarter that creators from Africa cannot access.

Despite the barriers, people still make and create value. Makers in Ghana and Nigeria cobble together different strategies, and while it might be too early to point to a definite model, it is clear that they are keen on making locally relevant products and are eager to simplify the processes involved. We see three ways in which this could happen.

First, *makers need to better connect* with local retailers of components used in adjacent industries, such as electronics, construction and manufacturing. The gain here is that bulk purchases reduce the burden on individual makers. If additional components can be added to a large order of, say, transistors, there might be cost savings and greater predictability in availability of parts. Greater collaboration between makers and other crafts and industries around them might turn making into the alternative mode of production.

Second, for those needing to scale up, *low volume manufacturing* might be viable. We recommend dividing the components based on what needs to be manufactured overseas (like circuit boards) and what can be manufactured locally (like product cases, packaging and machined parts) with the final assembly done locally. Designing with this in mind can ease some of the pains and as demand increases, a modular assembly line can be expanded.

Third, *developing niche makerspaces* based on a common industry. Between both countries, there are a handful of general purpose makerspaces (e.g. KumasiHive). However, if makerspaces focused on specific areas the way Gearbox in Kenya does, they could establish signature projects to be implemented or attract makers to develop along these lines. Dedicated makerspaces could attract investors and help to change the erroneous perception of Africa from technology backwater to entrepreneurial digital hub.

*\* We thank our friends in the Ghana and Nigeria maker communities, particularly KumasiHive and Best Maker Forum in Ghana and Hardware Lagos in Nigeria, for their insights. Digital Africa is a collection of posts exploring 'African Media in the Digital Age,' also the subject of an International Communication Association Preconference held at Stanford University in May 2017. The posts were compiled and edited by Toussaint Nothias, a lecturer in the Center for African Studies at Stanford University.*