Design(ing) 'Here' and 'There': Tech Entrepreneurs, Global Markets, and Reflexivity in Design Processes

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ABSTRACT
HCI shapes in important ways dominant notions of what counts as innovation and where (good) design is located. In this paper, we argue for the continuous expansion of the body of critical and reflexive work that asks both researcher and designer to reflect on their values of design in the world. Drawing from ethnographic research in Accra, Ghana and Shenzhen, China, we illustrate how design is as much about making artifacts as it is about producing national identity, reputation, and economic gain. Technology entrepreneurs take from and resist the discourse of their cities as emerging sites of Silicon-Valley type innovation. They render the narrative of "catching up with the west" overly simplistic, ahistorical and blind to situated practices of design. This view, we argue, is critical for interrogating our views of design especially as it becomes more central in the contemporary global economy.

Author Keywords
Design; designing; production; global south; China; Africa; making; participation.

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION
On the August 3, 2015 episode of NPR's 'All Things Considered', Gregory Rockson, a young Ghanaian technology entrepreneur, was interviewed about his tech startup, mPharma, in the wake of some high profile visits to Accra, Ghana and other cities in Africa by the CEOs of global firms. In the interview, Rockson described the work that he and others like him are doing as part of a "New Africa story whereby it is about Africans taking ownership of the problems of Africa. It's about Africans creating the solutions that help solve and lift the multitudes of Africans who are in poverty out of that … It's no longer about sitting down and having Westerners come in to the continent to do charity."[51] Rockson hints at a broader discourse that portrays Africa changing in ways that breaks from previous entanglements with the west; one characterized by the prominence of a narrative of the poverty of Africa (both in terms of material wealth and socio-cultural values) and the wealth of the west as its savior. The break, as suggested by Rockson, will happen through the use of digital technologies to 'leapfrog' into prosperity.

Accra, where Rockson is based, appears to be on the cusp of some economic shift. More young people are venturing into entrepreneurship focused on different kinds of technology, services, and the arts. The densely populated city of Accra, alongside others like Nairobi (Kenya) and Lagos (Nigeria), has been touted as a new space for African innovation to emerge. Much of this talk is based on the emergence of numerous startups in technology as well as tech focused co-working spaces and labs that have sprung across the continent in the last 5 years. Terms like 'Silicon Savannah' have been used to describe the tech scene in Nairobi, with the general sense that pockets of sub-Saharan Africa are moving towards some new tech revolution [13].

This view has an analogous version from China, where a growing number of investors, entrepreneurs, and large corporations have begun to turn their attention towards Shenzhen, a city located in the South of China, in Guangdong province, just north of Hong Kong. Shenzhen and its surrounding regions produce much of our contemporary end-consumer electronics today, from the Apple iPhone to hoverboards and selfie sticks. Over the last few years, entrepreneurs from around the world have flocked to this region to turn visions of the Internet of Things into consumer end products. Venture capitalists and international corporations including but not limited to Intel, Qualcomm, and Microsoft have followed suit, investing in Shenzhen's expanding convergence of hobbyist makers, start-ups, and manufacturing cultures [35, 36]. International media began celebrating Shenzhen as a rising hub of technological innovation, proliferating new labels for the manufacturing hub such as "Silicon Valley for Hardware" or "Hollywood for Makers".

In this paper, drawing from long-term ethnographic research in Accra, Ghana, and Shenzhen, Guangdong, we

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examine how it happened that the two cities became enrolled in contemporary discourses on design and innovation that portrays them as emergent from the "periphery" [16]. This view, from industry, local and international press positions Shenzhen and Accra as newly innovative and reinforce a center-periphery dynamic, with the west (or more specifically, Silicon Valley) standing as the global center of technological innovation around which these sites coalesce or move toward. In our research, we found that such populist notions of center and emerging periphery are both productively used and contested by the people we worked with in Accra and Shenzhen. We elaborate briefly.

We worked with two differently positioned yet increasingly intersecting groups of technology producers in Accra and Shenzhen: 1) those who self-identified as start-ups, tech entrepreneurs and designers working in creative IT industries, many of whom had received education and/or worked abroad and flexibly operated a global network of business partners, collaborators, and investors, and 2) those who self-identified as entrepreneurs, industrial designers and professional producers working in the manufacturing industry, most of whom have not traveled abroad, but nonetheless operate through their design practice a set of global market relations. Each site of design and production, as we will show in this paper, continuously negotiated its own position in relation to contemporary innovation discourse and to shifts in the global market economy. Our interlocutors challenged the notion that the west was the supposed center of contemporary design and innovation, while they also productively leveraged the discourse on innovation at the periphery for their entrepreneurial practice. Often they expressed doubt of and critiqued the investment programs and government initiatives in their respective regions, while at times benefitting from the attention and investment.

Accra and Shenzhen, then, simultaneously feed into and challenge dominant stories of what counts as design and where it is to be located. Their design processes and artifacts unfold through and hand in hand with national and regional aspirations and ideas about what counts as innovative and good design in the west. This paper proceeds as a response to an expanding body of HCI research that has called upon researchers and designers to decenter western notions of design and account for the ways in which those we study or design with/for construe their practice as different or similar to perceived centers of innovation and design [31, 59]. Through the empirical cases from Ghana and Southern China, we present a critical examination of how contemporary design practice unfolds from the perspectives and positions of those who perform design work and how they both purposefully distinguish from and relate to what is typically thought of as 'proper' or 'good' design or that which comes from the "center" of innovation.

Empirically, we show that designing meant, for the people we worked with, both the making of products *and* the articulation and crafting of their own relations to global markets of technology production and innovation. Designing, in order words, was not just about the making of things or about studying users in order to improve design, but also fundamentally about participating in and articulating one's relationship to the global economy through a global center-periphery narrative. Designing was cultural production, and economic goals and political considerations were part and parcel of the practice of designing. The ways that market considerations figured in design work constituted both a negotiation of self/place within the center-periphery narrative of innovation, and a pragmatic pro-activeness in designing technological products.

The work that we present in this paper follows a line of critical HCI and design work that advocates a more reflexive study and practice of design [56, 8, 10, 11, 19, 21, 25, 31, 46, 50, 60, 64]. Sengers and her colleagues for instance, demonstrate the importance of reflecting on how design is done and thinking about who gets to decide what counts as (good) design and why [50]. Others have challenged western origin stories in design, promoting a more participatory and democratic approach towards locating design [21, 26, 32, 33, 36, 59]. We perceive an opportunity to further expand this critical trajectory to include design(ing) itself, how it is construed, and where it is located. When we say design(ing), we speak of designs (noun), i.e., the materialization of an idea either as artifact or product, *and* designing (verb), *i.e.*, the process and practices of enacting/articulating a complex set of motivations, visions, ideas, and goals. For the purposes of this paper, we employ the shorthand 'design(ing)' to advance an understanding that the production of artifacts, market considerations and ideologies are fundamentally tied together in ways that are yet to be fully accounted for in HCI design studies.

By focusing on design(ing) in Ghana and Southern China, we do not mean to point out difference and complexity "over there" in order to open up new spaces of design [59]. Rather, our goal is to probe the ways that HCI thinks about design, how we may unwittingly contribute to existing exclusionary frames when it comes to both researching and practicing design, and how we might continuously orient ourselves towards such biases. By this, our aim is to contribute to expanding a program of design(ing) in HCI that evidences a commitment to critical self-reflection with regards to how we as designers/scholars/teachers and so on practice/study/teach design, but also, and perhaps even more importantly, where we locate it, who we partner with, and how we construe (good) design in global relations of technology production.

RELATED WORK

Prior research has challenged overly simplistic binaries and frames of difference between "us here" and the rest "out there" [1, 2, 21, 22, 31, 32, 33, 35, 59, 64]. Drawing from an interdisciplinary range of perspectives, this prior work has provided an analytical program that de-centers a normative (e.g. white, male, urban, Western, *etc.*) view of design [10, 31, 35, 50, 59] and offers alternatives to taken-for granted analytical categories [3, 7, 59]. In calling for what they label postcolonial computing, Irani *et al.*, for instance suggest that, "thinking about the design process in terms of engagements between different goods, the complexities of articulating perspectives, and the implications of translation between sites, provides a starting point for acknowledging and embracing heterogeneity in design, rather than attempting to control or eliminate it" [31, p. 9]. This demands, as Alex Taylor put it, a move from "reporting back" from "out there" to "keeping an eye on what we are doing 'right here'"[59, p. 693].

This view of articulating a 'here' as different from 'there' requires a 'universalist logic' that post-colonial and feminist scholars have identified as essential to the process of 'othering' and colonization [6, 16, 21]. In what they call 'Ubicomp's colonial impulse, Dourish and Mainwaring [21] suggest that companies like Google can be likened to the metropole (*i.e.*. the United Kingdom, the center of the British Empire) at the height of the colonial era given the ways that digital knowledge and information is today ordered on a global scale. The legacy of privileging scientific knowledge during the European enlightenment and its relationship to the colonization project is alive until today as it is, for instance, reflected in the narratives around information technologies and their emancipatory or alternately, disruptive, effects on 'those in the periphery' [31, 43, 57].

Truna, for instance, demonstrates this by showing how multiple narratives around a Khoisan gamer's participation in the World Cyber Games ultimately position indigenous populations as outsiders in the techno digital world [57]. Likewise, Bidwell's account of designing social media in rural South Africa reveals how writing culture and social media evinces a bias towards an individualistic logic that "limits [the] affordances for forms, genres and other elements of communication that contribute to sociality" [10, p. 1]. We follow these prior works by showing how the technology designers and producers in our sites simultaneously critiqued and located their work in the same center-periphery discourse that these prior works take on.

HCI researchers have also begun to articulate a critical scholarship of contemporary cultures of technology production [1, 2, 16, 25, 35, 36, 37, 41, 44, 50, 61]. This work has demonstrated that making cultures, albeit celebrated as having the potential to democratize technology use and production in new ways and as an inclusive and open space, have remained fairly exclusive, largely white and male. These scholars have also called upon HCI to reflect our own entanglements with these projects [2, 64]. These various works have also tackled how making takes place outside more conventional research labs and design studios [2, 36, 63], and transnational configurations [64]. In proposing multi-sited design, [64] present us with an analytical lens through which we can better understand global relations and transnational links as they unfold through specific sites of design, and help translate between designers and researchers.

These aforementioned works are also strongly aligned with a much larger body of work centered on the politics of design. Value-sensitive design, values in design, reflective design, critical design, critical making, and feminist HCI have all argued for the importance of designers acknowledging that their view of the world shapes their designs and the world within which they unfold [3, 6, 8, 9, 12, 24, 21, 22, 50]. Sengers *et al*. [50], for instance, propose opening up our conceptualizing of the design/designer's context when they say, "technology design practices should support *both* designers *and* users in ongoing critical reflection about technology and its relationship to human life." [p. 50]. To do this, they argue designers ought to reflect on the "unconscious values embedded in computing", as they become part of the technologies created. In their estimation, we need more analysis of the ways that cultural assumptions become reflected in design and this we agree is crucial to develop a reflective practice of design(ing) in HCI.

Following this line of research, our commitment, here, is to provide an account of the ways in which our interlocutors in Accra and Shenzhen are design(ing) the present and future of their cities (alongside the narratives of international investors, media outlets, corporations, and scholars). In our analysis, we bring together the reflexive stance central to third wave HCI design [11, 50] with the cultural, geopolitical and socioeconomic sensibilities provided by postcolonial studies, feminist HCI, and transnational studies [3, 6, 16, 31, 35, 36, 64]. Our underlying goal is to further open up design(ing) as a practice and site of research in order to move towards a program of reflexive design studies within HCI that takes as seriously geopolitical processes, individual and collective aspirations, nation building, and discourse as it does materiality, aesthetics, and technical feasibility.

METHODS

We draw from the two authors' respective long-term ethnographic research engagements in Africa and China. Our analysis derives from participant observation, in-depth interviews, and textual/discursive analysis of popular discourse on technology design, innovation and production. The value of the discursive to situating the broader socio-political and economic world that HCI functions is crucial if HCI is to fully accommodate the contemporary world where human activities are mediated by computing [8, p.

50]. As is common in ethnographic research, we prepared sets of interview questions, which we expanded and modified as we went along and identified emergent themes and new questions.

The data from Ghana is a combination of multiyear observations, interviews and review of literature, conducted by the first author, in both academic and popular press about technology production in the country. A range of entrepreneurs and tech entrepreneurs in Ghana and from Ghana but living in the United States were interviewed in 2012, 2013 and 2015. These entrepreneurs span different ages and backgrounds and work across information technology (software, infrastructure, services, mobile), media (radio, internet, TV, marketing), finance (investment) and fashion (design and production). A significant number of them are 'returnees' – Ghanaians who migrated out of the country to seek education and employment elsewhere and returned to work years later. From this larger body of work, we present cases of design from the perspective of those who work in Ghana's IT industry. Design, in this relatively young industry space, largely pertains to software and service provision.

The case from Shenzhen, Guangdong, China, is based on 5-year long ethnographic research conducted by the second author, focusing on both hobbyist and professional design and production cultures in China. Research includes participant observation in hacker and makerspaces, co-working spaces, incubators, factories, hardware facilitators and design solution houses across the cities of Shanghai, Beijing, and Shenzhen. An integral part of the ethnography was the participation in design-related activities including but not limited to open source hardware prototyping, hackathons, design workshops, and design for manufacturing. This long-term project also included a one-year long ethnography dedicated to understanding the contemporary remake of Shenzhen from a manufacturing hub into a global innovation center. This included interviews and participant observations with diverse cultures of design and production: engineers, designers and managers in factories, traders and sales teams, as well as small-scale start-ups and large international corporations interfacing with Shenzhen's manufacturing ecosystem. Although we have interviewed people from a wide range of backgrounds, for the purposes of this paper, we draw on a subset of our interviews, which were conducted with people living and working in Shenzhen.

Throughout this research, we collated hundreds of hours of video and audio material of interviews, field visits, panel discussions, hands-on workshops and discussion sessions. In total, we conducted over 180 formal interviews and surveyed 70 relevant stakeholders including software developers, tech entrepreneurs, hobbyist makers, members and founders of hacker/maker spaces and startups, organizers of maker related events, and open source hardware entrepreneurs, factory workers, owners, and managers, government officials and policy makers, employees in design firms and large IT corporations, artists and urban planners, and investors.

"INNOVATING WITH SHENZHEN"

In April, 2015, at the annual Intel Developers Forum (IDF15) in Shenzhen, Intel CEO Brian Krzanich announced a strategic alliance between the American multinational semiconductor chip maker and one of its biggest competitors in China, the semiconductor company Rockchip. The renewed partnership between Intel and Rockchip came at an opportune moment. Over the last years, Intel had to take big cuts in the non-iPad tablet market, largely due to the growing success and reach of its Chinese counterparts Rockchip and Allwinner – companies that centrally shaped the rise of Shenzhen's global market outside of the US and Europe. The partnership between Intel and Rockchip should, according to Intel, guarantee continuous leadership in established markets such as the PC and the tablet industry, but more importantly, also help firmly anchor Intel as *the* core platform for the next era of computing: the age of the maker movement and Internet of Things. As Krzanich put it:

"The local and global impact of our 50 years of Moore's Law innovation and 30 years of strong collaboration and winning together in China is unmatched. Intel remains focused on delivering leadership products and technologies in traditional areas of computing, while also investing in new areas and entrepreneurs – students, makers and developers – to find and fuel future generations of innovation with China" [30].

Rockchip has until recently received little attention by advocates of technology innovation – as has the city of Shenzhen, where this renewed alliance was forged. If anything, Shenzhen used to be known as a place that stood for low-quality production and "made in China," far from any connotations of "innovating with China" as Krzanich characterized Intel's 30 year long relationship with the region. The rise of Rockchip is fundamentally intertwined with the story of a unique design and production culture that emerged in Shenzhen alongside and in the shadows of the region's history of outsourcing and vertical integration facilities.

Shenzhen was declared a Special Economic Zone in 1979 by the Chinese government, making it an attractive site for companies moving their production facilities to low-cost regions amidst the Western IT outsourcing boom [28, 35]. Shenzhen's history, as documented by [40, 41, 23, 65, 15] shows that the growth of manufacturing in part enabled the turn of the 50,000 people city into a metropolis of 10 million within 10 years. Along with that, the region experienced a quick upgrade of technological and organizational skills. Large contract manufacturers like the Taiwanese company Foxconn opened facilities in Shenzhen, catering almost exclusively to large brands like Apple or HP. As this happened, a collective of

entrepreneurs saw an opportunity arise in the gaps of the global market economy. They set up a horizontal web of component producers, traders, design solution houses, vendors, and assembly lines, and began catering to less well-known or no-name clients with smaller quantities.

This informal network of design, engineering and production facilities is today also often known as *shanzhai* (山寨)in Chinese [35, 37]. By working together, the at first small but quickly expanding network of producers, designers, entrepreneurs, engineers, vendors, and traders was able to compete with the large contract manufacturers and their international clients, reaching emergent global markets previously untapped by Western IT giants. Rather than focusing on one big client like Apple, the network of producers turned towards newcomers to the market who were interested in small-batch production and quick market penetration in regions like Africa, the Middle East, South America, and South East Asia. In *shanzhai* production, a mobile phone can move from ideation into the market within 29 days [35]. Products are market-tested directly by throwing small batches of several thousand pieces into the market. If there is demand and they sell quickly, more will be produced. If the market demands something else, alterations to the functionality and design will be made. Here, prototyping and consumer testing occur rapidly and alongside the manufacturing iteration process, rather than occurring beforehand (where it is commonly placed in western-centric, primarily Silicon Valley type design models). It is exactly this approach towards design and production that has enabled local chip manufacturers like Rockchip to eventually compete with internationally renowned corporations like Intel.

In turn, Shenzhen's homegrown production has expanded into a multibillion USD industry with global reach. Indeed, Intel is not alone in promoting Shenzhen as a contemporary site of innovation; since roughly 2008, a growing number of makers, hardware entrepreneurs and eventually investors have turned their attention towards the city, promoting it as the nucleus for implementing the next wave of technological innovation [35, 36]. Shenzhen is enrolled in the vision of the rise of the global maker movement, which promises individual empowerment and economic transformations across developed and developing regions through the enabling of a return to production [36].

Rewriting copycat as global brand

In 2008, Yan Xu (anonymized) moved from Xi'an to Shenzhen upon the urging of a relative who worked for the Chinese car manufacturer BYD (Build Your Dream). Xu received a stipend from BYD to obtain a college degree, and then stayed to find a job in the local manufacturing industry. Only two years later after his arrival, Xu made a name for himself in the manufacturing community by releasing one of the first "copycat" Apple iPads. Most notably, his version of the device came to market in China weeks before the product was officially released in the United States. Because of this, in the Shenzhen manufacturing community, the device was never thought of as copycat, but a unique creation, specifically designed for the needs of the Chinese market.

Xu was one of many who came to Shenzhen to "make it." The year of his arrival, 2008, was a pivotal time as it coincided with the term *shanzhai* first being applied to the workings of an expanding manufacturing industry. *Shanzhai* became part of the vernacular after a 2008 TV show that ran online and mimicked the official CCTV spring festival gala (that aired on TV only) by featuring ordinary citizens instead of high-profile celebrities [28]. *Shanzhai* connotes a 'Robin Hood' countercultural spirit, referring to Chinese folklore that told the story of 108 rebels hiding in the mountains and taking from the rich and giving back to the poor [35]. Zhang and Fung show that *shanzhai* became "a cultural myth, a powerful story, and a historically embedded narrative that combined the traditional Chinese metaphor of grassroots anti-establishment heroism with modern rhetoric of technology-empowered bottom-up democracy" [66]. With the rise in electronic production, *shanzhai* became the ideal term to account for the myriads of electronic creations that came out of Shenzhen; from Xu's tablet over to the iPhone that runs on the Android operating system, to feature phones designed for niche markets. Scholars of China have largely paid attention to *shanzhai* as a heroic and democratizing force, rather than accounting for the changes in the global market economy that *shanzhai* production both shaped and was shaped by [28].

In China, today, *shanzhai* is often understood in negative terms. China's history and culture of copycat production, many middle class Chinese argue, is something that signaled the nation's continuous lagging behind in international comparisons of technological advancement. Entrepreneurs like Xu, similarly, tend to avoid associations with *shanzhai*. Since his arrival in Shenzhen, Xu has partnered with Intel not only on the production of tablets for the non-iPad market, but also more recently on Intel's forays into the maker and open source hardware communities. At a 2015 Maker Faire in Shenzhen, this long-term partnership between Xu and Intel, while previously mostly kept in the background, was actively promoted as a central piece in enabling Intel's contributions to maker-manufacturing convergences in Shenzhen. Xu's case is but one example of a significant shift in how Shenzhen-based products and companies are positioned in global markets. One of the most well known examples of this development is Xiaomi (小米), an affordable yet high-end smart phone maker that has made international news and that many Chinese are proud of as a globally recognized brand that represents quality design [52]. In promotions of Xiaomi's innovative capacity, the company's ties with *shanzhai* production are not mentioned.

Even though the term *shanzhai* is rarely used these days, its underlying production processes, rooted in open sharing amongst a close-knot high-trust network of producers [35], are still very much in place. Paired with "modern" marketing techniques, they enable an even more rapid expansion into new markets. For instance, in parts of Africa, *shanzhai* phones were known as "Chinese phones" and stood for low-end copycats [29]. Recent rebranding efforts by *shanzhai* producers, however, has proliferated an image of *shanzhai* phones as good quality and value for money. For instance, one such Shenzhen producer, Tecno Mobile, has pushed a series of smart phones to the market, branded specifically for the sub-Saharan Africa market. Their advertisements highlight features that the target market would find valuable and particular. In one such ad, a wide screen smartphone is shown on a black page with the image of a black woman showing on the screen. The words "capture the beauty of darkness" are written in bold beneath the image, followed by the line "The phone is powered for low-light shooting". The ad labels the phone, 'Camon C8', as a solution for a commonly held frustration with most other mobile phone cameras that render poor quality photos of dark-skinned subjects in low-light settings. Tecno Mobile, here, positions its phone as a smart and global brand that understands its consumers' needs well. Portraying phones by Xiaomi or Tecno as "also" well designed (alongside let's say an Apple iPhone) leaves out their unique processes of production and market placements through *shanzhai* production culture: rapid prototyping, open sharing and horizontal manufacturing that respond flexibly with the intended market [35].

The question about China's production and whether or not it 'innovates', according to one director of the consulting firm McKinsey's Shanghai office, should be laid to rest because innovation clearly is happening. In his words, "The number of Silicon Valley–based investors visiting China to learn from Internet-enabled business is now remarkable." He offers for evidence, what he called the tipping point when he noticed in a recent trip to India that, "no longer were there complaints about the low quality of Chinese industrial goods; instead, there were compliments about their remarkably high quality" [42]. Today, in stories of Shenzhen as "Silicon Valley for Hardware," *shanzhai* production processes are rebranded and renamed, which not only helps avoid any negative connotations with copycat, but also constitutes a powerful rhetorical move. Intel, for instance, calls *shanzhai* the "China Technology Ecosystem" or CTE and the city government has been working hard to reframe the city's image from a manufacturing hub to a city of design.

Design here as it has developed through *shanzhai,* is not driven by a countercultural ethos to challenge western authority claims over design and innovation, but is rooted in a business instinct and the desire to make a better living [35]. Nevertheless, its growth and evolution alongside other production practices in Shenzhen destabilizes contemporary notions of "designed here" and "manufactured over there".

ACCRA, GHANA

Following independence from the British in 1957, Ghana's international trade and global market participation followed the same patterns as during colonization – largely exporting primary goods (gold, copper, cocoa, and more) and importing finished goods. Origins of these goods have shifted over the years, with China supplying most of the imports in Ghana today. Within this historical context, the communication technology industry is fairly recent in Ghana's 59 years as an independent country, picking up in the early to mid-2000s.

In the early days of mobile phone use, in the late 1990s and early 2000s, devices came from European companies like Siemens and Nokia. As the global market for handsets changed in the 2000s, this shifted to Chinese companies like Huawei (which competes with Apple and Samsung in the higher end markets), Tecno (which aims for the middle and lower end markets), and a whole range of no-name devices serving the lower end. By 2015, there were six cellphone service providers for the country of 26 million. These shifts – competition in local service provision from multinational firms and greater variety of affordable handsets – meant that mobile phone penetration and use has overtaken all other kinds of technologies that Ghanaians use [3]. These 'basic market/economic' principles of the supply and demand of technology goods are very much tied to what emerges out of the country in terms of technology design, which is mostly software based, today.

This is most visible in the increasing number of tech startups in Accra where entrepreneurs say they work to serve the large base of mobile phone users in the country. Many are e-commerce providers, some are payments processers, and others work as consultants for various IT needs in the formal sector. A few of the more established firms focus on infrastructure (such as the provision of enterprise servers). Many tech entrepreneurs hope their products will expand to other markets in the global south. In our interviews and conversations, many tech entrepreneurs specifically brought up the 'global south' in order to market their design and product/solution choices as addressing local and cultural specificities.

Often design practices were motivated by the goal to address an immediate everyday challenge – one that was linked to the broader infrastructure of a developing country, and tied to the political economy of Ghana [4]. This included, but was not limited to, the design of software that addressed problems in processing digital health records, insurance claims, utility bill payment, lack of a functioning addressing system, robbery alerts/home security, etc. In designing a technological solution, our interlocutors made sense of their work in the following ways: 1) other places (the north) did not have these problems and therefore there has to be a homegrown solution, 2) Ghanaian tech

entrepreneurs are equipped to solve these problems despite or perhaps because of the absence of certain infrastructure, and 3) other global south countries probably shared these challenges so their products or services would eventually become transnational/global.

This isn't to say that all the designs we encountered were aimed at an infrastructural problem. There were apps and software aimed at play and leisure, but were nevertheless couched in terms of a local, Ghanaian, African need. Take for instance an interactive media company that initially started out as a gaming company. The company designs African themed games and mobile comics as a way to inject content and contexts that its designers considered missing in their own play when they were younger. In an interview in 2012, the founder of the company emphasized that the company's aim was to "kick start the gaming industry in Africa. It goes beyond just a company." He envisioned his project to contribute towards the 'entire African continent' entering the global gaming industry, complete with African characters, stories, and content. These needed to be on mobile devices, he reasoned, given the limited network infrastructure to support the kind of online gaming done in places like the United States or South Korea. He further explained that because reliable network infrastructure was not available did not mean that innovative gaming solutions could not be built. To that effect, his company created what he called 'a back-end infrastructure' to support low bandwidth play on mobile phones. The company also developed a range of games and comics optimized for mobile phones, motivated by the goal to create a new market by changing what gaming online can be when the dominant infrastructure used elsewhere is unavailable. In the company's marketing material, the message about using African talent to create African content to a global audience echoes these aspirations by drawing upon "local expertise that competes globally." While deconstructing the notion of "Africanness" as is depicted in their products is beyond the scope of this paper, we show how it materializes in design in what follows.

One of the mobile comics created by the company is called Africa's Legends. The comic's plotline is based on an old Ghanaian folktale about Ananse, 'a spider god', and a regular motif in Ghanaian folktales appearing as a trickster. In the graphics of this mobile comic, each page looks like a typical printed comic, but with pages advancing on their own with a soundtrack of different instrumental arrangements that use the rhythms and melodies of southern Ghana playing. Throughout, Adinkra symbols adorn the regalia that the gods in the story wear.[1] All the characters are phenotypically 'African', in that they are dark skinned, have features common to people originating from the subcontinent and are dressed in 'traditional' Ghanaian attire. While the level of recognition and decoding will depend on varying levels of familiarity with Ghanaian history and culture, there is a clear visible effort to render the story closely aligned with a particular place and people. The importance of having an 'African' representation in the global market to this company, then, is not just an articulation of place relative to a distant global imaginary. Its unique selling point is produced in part through aesthetic and design choices, that (ideally) should intervene in a global marketplace (Android and Apple digital stores) to tell an 'African story'. In branding their products as 'African', the gaming company also arguably participates in processes of 'othering' that the center-periphery narrative trades on. Africa's Legends is not only about selling a 'cool' game – it is also about providing visual and narrative content of a place (broadly construed) and a people (one representing the many – Ghana representing Africa) that the designers believe are largely absent in both national and global markets. Yet, the tech company did not conceive of this strategy as a design problem, rather, but as a creative response to a world that heavily relies on homogeneous distillation of cultural motifs.

In seeking a solution or avenue for play or problem solving through software development, our interlocutors kept the global market economy in sight even as they started 'small'. Throughout various projects, we observed that the global remained a constant in how people situated their work. Take, for instance, the issue of payment processing. We saw solutions that allowed people with debit cards to pay from their mobile phones, even though banks themselves have not yet fully automated payment processing for their clients. Other solutions tackled the problem from an enterprise perspective, designing software that banks could use to provide the same service that those designing on the consumer side were providing. All were conscious that fragmented responses are not ideal but indicate that the market would consolidate soon. One entrepreneur expressed this as Ghana needing to create its own workable payment system in order for it to join the global system of finance. To this end, his company has built a cloud-based system of solutions that other companies and entrepreneurs in the country can draw upon. This includes internet banking, mobile banking, transaction tracking – all integrated in a system that makes their clients' businesses run, as far as the designers are concerned, as well as others do 'elsewhere'.

In another example, we spoke to the CEO of a company that had created software for the management of health insurance claims. At the time of the interview, his company had beta tested across a number of hospitals and the team was focused on fixing bugs. The CEO's initial idea was to build a platform that would make it easier for health records to be accessible from anywhere in Ghana. It seemed fairly

[1] Adinkra symbols are visual motifs created by people of the Akan ethnic group in Ghana. Each Adinkra symbol has a specific meaning, often a proverb, attached. These symbols are incorporated in architecture, furniture, textiles, and jewelry and have been in use since the 1800s.

straightforward and appeared a clear need at the time, he explained, to provide a system that enabled medical records across hospitals and health care providers. The company's designers began field research and interviewed doctors, administrators, and hospital staff. Some of their findings included that insurance companies were central to healthcare delivery (something they had been blind to) and the team pivoted and focused on building a platform that allows hospitals to easily complete medical claims and send them electronically to the insurance companies.

While this process appears arguably as a familiar design approach rooted in field research, a feasibility study and pivoting where necessary, we wish to draw attention, here, to the underlying global aspirations and sociopolitical processes. The initial design idea shifted once it encountered the lived realities of the anticipated users. Once that reality made its way into design, it evolved with an eye towards both the local situation and a global south context. The company knew at the time of production that the local government had commissioned the development of a health claims processing center that would source data directly from government hospitals, with the underlying goal to streamline a national health insurance scheme. With this in mind, the company focused its design on a way that could be used by both private and public hospitals to transfer claims electronically to insurance processers. A multinational firm focused on biometrics (with headquarters in Europe and offices in the United States and Ghana) recently bought this company. Ever since, the software has evolved to accommodate a tripartite system of claims processing, biometric registration, and health records verification. The acquisition by a multinational firm was perceived in the local entrepreneurship scene as a success and validation of their global aspirations.

In response to the absence of hardware production capacity for electronic goods, tech entrepreneurs in Ghana are designing software and service solutions. They frame their design work as addressing immediate and local needs, while articulating their approach as globally applicable. Gaining recognition in the global market was not necessarily about economic profit. Many were driven to participate in a global market of tech innovation in order to challenge existing notions of "here" and "there." "Here" stood for both local and transnational Africans, whose lives were not easy or predictable. Business and design decisions are expected to be flexible with the expectation that one can succeed in spite of infrastructural challenges. "There" materialized as a place in which the global market worked smoothly without the everyday challenges of "here." When Silicon Valley came up in our interviews, it was to drive home the point that those "over there," in a sense, "had it easier," because they would not have to contend with the challenges of doing technology production "here." In this articulation, Silicon Valley is imagined as a place of opportunities and wealth of access to financial and technological infrastructures. As one entrepreneur put it, "raising funds in Ghana for the kinds of things that we do is like squeezing water out of a rock". Similarly, many people we encountered in our fieldwork made productive use of such distinctions between "here" versus "there" in order to make sense of their resources and surrounds, but also in order to position their work as unique in global networks of tech innovation.

DISCUSSION

One of HCI's core legacies lies in providing a myriad of methodological and epistemological tools to study and design for diverse contexts of use. HCI thinks critically and in nuanced ways about the various contexts that users around the world bring to technologies. HCI research has shown that context of use is not a fixed, descriptive element but produced in action [18]. An expanding body of critical HCI scholarship has shown that the context of design is similarly not fixed, neither in a lab nor in the west. While design research has challenged the idea that design originates from the west (center) and filters to 'the rest' (periphery), the center/periphery narrative, however, still shapes broader discourse as the findings reported in this paper evidence. In this paper, we have demonstrated how the broader discourse of innovation, and in particular Silicon Valley type innovation, frames articulations and design practices as people position their work both in relation and opposition to dominant discourse.

Our approach extends from the body of work that has been concerned with how design takes place, how the designer fits in the process, and how the designer's subjectivities intervenes in that process. For instance, the Scandinavian school of HCI, with its legacy work in participatory design, has underscored the importance of studying how people use and co-design systems in specific and situated contexts [9, 25]. This work has demonstrated that the user context is tied to the design context in ways that defy a neat separation of the two spaces. One of our underlying aims, then, has been to follow [59, 30] and others in relocating design from a practice "here" (as in: the corporate or university research lab, in the West, in HCI, etc.) to understanding it as unfolding through what anthropologist Anna Tsing has called the "sticky materiality of practical encounters," to account for the ways in which "universals" are produced and enacted in specific sites and moments of encounter [58]. "Universals" like capitalism, and globality, according to Tsing, only exist in their particulars: they are enacted and negotiated in practical encounters rather than constituting an abstract force.

We have applied this approach in this paper by zooming in on the ways in which universals like innovation, design, and technology production are enacted and negotiated from within specific encounters and lived experiences. Our goal, here, is to speak to this rich body of work as a corpus that is leading us to seek deeper accounts of design(ing) both 'here' and 'there' - examining places and practices commonly not thought of as design. This is to lead us, as

researchers of design, to a place where we can build theory that is inclusive of diverse design practices and cultures. We now continue by tying the analysis of our findings to an outline of a reflexive practice and study of design(ing).

Design(ing) and positioning in relation to the global

For our interlocutors, design(ing) meant in part positioning their work in relation to both the global market of technology production and specific local, national, and economic processes that unfolded within their immediate sites of intervention. They responded, for instance, to the ways in which Accra and Shenzhen became enrolled in a broader imaginary of tech innovation relative to the west. Their relations to Accra and Shenzhen were continuously negotiated, simultaneously feeding into but also resisting western understandings of what counts as technological innovation and design. Aspirations towards being taken seriously by the west as partner in innovation practices were in part enacted by demonstrating difference: what made Accra or Shenzhen unique and different from the west was what design was about.

The entrepreneurs and designers we worked with in Accra and Shenzhen share a shift in focus from western prototypes and models of design to developing from homegrown cultures and histories of production. In the Ghanaian case, design(ing) unfolds through narratives of identity, place, and self-directed action and worth. Many framed their approach towards design(ing) as innovative intervention, because of its pragmatism and rootedness in local needs. Framing Ghana, and with it Africa, as a terrain that posed challenges for designerly interventions, was a way to legitimize their work globally. In positioning their work as previously outside and now participating in a global market that hails western design innovation as the standard to aspire to, they simultaneously intervened in the story of the periphery needing design intervention from the west.

In the case of Shenzhen, we showed how a homegrown production economy developed alongside the better known vertically integrated manufacturing contract model patronized by Apple, HP, IBM, and so on. This parallel production culture caters towards markets not yet tapped by large international firms. Globality, here, is enacted less on western-centric terms, but rather through relationships that emerge both outside of and alongside the more familiar US-China-Europe network. Despite these developments, *shanzhai* production, and with it Shenzhen, has long been, and continues to be, portrayed by both national and international media as "still" backwards, because of its loose regulatory system that allows people to navigate around the constraints of intellectual property to, so to speak, rip profits off honest businesses. *Shanzhai* production is rarely thought of as (proper) design, because it functions, as we have shown in this paper, in many ways differently from approaches such as human-centered design or design thinking, which are portrayed as systematic and globally applicable through the language of universality attached to them. With its deeply situated design practice, and its global market reach, *shanzhai* sits uncomfortably with perceived notions of what counts as good design(ing).

Reflexive design(ing) & market relations

The cases of Shenzhen and Accra remind us that binaries such as production vs. design, and copycat vs. innovation are still present in technology and innovation discourse today [16, 59, 31]. In our research, we saw that market considerations were integral to the ways that design materialized. It reminds us that around the world (including 'here'), shifts in the global economy shape how design is practiced and what it means. For instance, designing for local markets in Ghana also meant, for our interlocutors, to shape Ghana's place in the global economy. Our interlocutors in Shenzhen, productively made use of existing global infrastructures (vendor and trading relationships established during outsourcing and by large ODMs), and in doing so repositioned Shenzhen's place in the global economy. In reflecting on their practices, our interlocutors pointed to the importance of global perceptions and market considerations as part of the cultural work that accompanies the material and aesthetic choices of design.

It was clear to us also that while these so-called peripheral places were becoming part of the discourse of innovation, the so-called "center" was just as much adjusting to the exigencies of the global economy that has fragmented production capacities. In accommodating the reality that products are emerging from former outsourcing regions, western and global north firms have taken a rhetorical turn to establish a difference between them and their contract manufacturers. The most vivid of these examples, in terms of the production of digital technology is in Apple's labeling of product origin to read "designed by Apple in California, assembled in China." This has been replicated by other global north/western companies making everything from microwaveable dinnerware – e.g. Ciroa – to headphones – e.g. Bose – labeled respectively as "designed in Australia, made in China" and "engineered in the USA, made in Mexico". In response, global south companies like BRCK, based in Kenya, have also started labeling their products along the same vein, "designed in Nairobi Kenya, manufactured in the USA", providing what we might read as a tongue-in-cheek commentary on the decoupling of design and production in order to emphasize difference.[2] This rhetorical move presents a powerful narrative; enough that factories in Shenzhen have begun exporting their manufacturing and design processes to other regions in the

[2] The BRCK label also reads "If it works in [image of African map], it will work anywhere. See http://www.brck.com/specification/. Retrieved on January 8, 2016.

global South, while retaining "designed in China" headquarters in the city of Shenzhen.

In Ghana, on the other hand, the absence of a manufacturing capacity is considered by some of those we interviewed as an impediment to economic growth. Many interlocutors interpreted the fact that the nation imports much of its consumer goods as a failure of the national project post independence. In this articulation, design and production cultures are articulated through a colonial history as well as a neo-colonialist present that reinforces a global imbalance either through public policy or market structures. In both our sites, design(ing) was simultaneously about making artifacts, markets, and global relations. Global market considerations were essential to the process of turning ideas into artifacts and providing services to populations that those at the "center" do not design for. These market considerations we encountered in our sites were neither outright sites of resistance nor complete buy-ins into the system. As such, a straightforward critique of their neoliberal tendencies would render invisible the ways in which they challenged typical center-periphery binaries.

These contradicting practices and values of production in Accra and Shenzhen demonstrate the importance of understanding design(ing) in multiple ways other than always necessarily as an individualized practice, *i.e.*, designing of an object or artifact or system for individuals to use. Design(ing) was also about making subjectivities, and some might argue, modernities. Articulating specific approaches and meaning making of design(ing) did cultural work, even as it was located within specific economic and geopolitical goals through the center-periphery narrative. Shenzhen's history and evolution as a site of technology production is culturally situated alongside globalization. Likewise, the internal structures of the Ghanaian economy that our interlocutors described were presented as a combination of the country's history and current economic relationships to the rest of the world. By taking seriously the argument that design(ing) is also about entering global markets, individual, national or regional aspirations and reputation, we confront the reality of meaning making that takes place alongside technology production. This is as important as the meaning making that HCI has long acknowledged users bring to technologies.

The designers and producers we worked with were highly reflexive about their practice. Their multiple visions presented by way of market considerations demonstrated a deeply reflexive practice of design in many ways compatible with the practices and values of researchers and designers in the HCI community. In other words, market considerations and design decisions were unfolding at once through global aspirations, desires for reputation and legitimacy and a critical reflection on these very desires. We take inspiration from this pragmatic criticality and reflexivity in our field sites to locate ourselves in this relationship (center-periphery) in order to question some of our unspoken a-priori assumptions about both design and critical scholarship. To a large extent, perceptions of good design still hinge on the assumption that proper design, the kind of design that might render it a scientific endeavor [53], necessarily has to be divorced from cultural processes, economic aspirations, and individual or collective reputation. Approaches such as human-centered design assume a universal model of design, that celebrating local specificities has the power to change social and economic lives across diverse cultures, politics, and histories. A reflexive study of design(ing), then, demands 1) that we (as in HCI researchers and designers) develop alternatives to such universals and 2) shoulder a responsibility of being seen as embedded in the 'center" and acknowledge the authority our voices and methods are given. What this entails beyond keeping our own biases in mind is to work towards including practices and sites that are typically overlooked and least likely to be celebrated as sites of innovation and design. By this, we do not mean to suggest HCI produce more internal accounts of the world "out there" as Taylor put it [59], but to be accountable for the ways in which HCI construes design(ing) [56] and acknowledge our responsibility – as the critical designers and thinkers we claim to be – to challenge the dominant view on design.

The question of how design(ing) is tied into the creation of capitalist values and markets for us also suggests that we confront, head-on, as researchers, HCI's relationship to industry and being more reflexive about how that relationship impacts our work. In recent years, industry supported research labs around the world have changed in size or disappeared altogether. Different configurations of funding have emerged and will continue to work their way into universities and the institutions that sponsor our research. We should be able to assess or at least remain conscious of how our own practice as researchers of design(ing) might also change in relation to such shifts in the local and global economy. What we argue for, here, then is a reflexive practice of design(ing) that takes into account design's own deep entanglements with processes of commodification and consumption regardless of where it is being done.

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