# Tinkering with Governance: Technopolitics and the Economization of Citizenship

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From statistics and mapping to engineering and medicine, technology has long been a tool of governance, shaping how nation states control their own and other regions' populations and natural resources. More recently, a nation's capacity to cultivate citizens as tech innovators and entrepreneurs is considered an indicator of its economic prosperity and global power. We show how this turn towards innovation and entrepreneurship is central to how technological and political elites tinker with modes of governance and define the relationship between the future of the nation and its citizenry in economic terms. Drawing from long-term multi-sited ethnographic research in the United States, China, and Africa, we present a subset of findings to show how these shifts in governance are being enacted through interconnections between politicians and technologists, and the products, spaces, and educational ideals they fund and create. We argue that making sense of these shifts in governance is essential for current and future CSCW scholarship as they intersect with issues of power within social computing.

## KEYWORDS

Technopolitics; governance; innovation; entrepreneurship; social computing, maker; policy.

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## 1 INTRODUCTION

In 2015, Chinese Prime Minister Li Keqiang urged local governments to support a culture of "mass making" to foster entrepreneurship amongst the masses (rather than just a set of privileged few). This cultivation of entrepreneurship would further enable the government's efforts to reposition China as a technology innovation leader on the global stage, the prime minister stipulated. Making, here, was positioned as a particularly timely approach that would enable technological and scientific innovation, upgrade old industries, and add value to China's manufacturing prowess by virtue of turning individual citizens into tech entrepreneurs. This would not only lead to global leadership in technoscientific networks, but also help solve China's rising unemployment problem [88]. In the same year in Ghana, the government put its support behind a private-public joint venture aimed at incubating information & communication technologies (ICT) businesses. The Minister for Communications at the time, Dr. Omane Boamah, argued at

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a launch ceremony that this support was because such ventures "challenge the mind and demand creative thinking", and in so doing, generate jobs and products that are globally marketable [1].

These two examples from China and Ghana mirror similar articulations elsewhere. The US administration under former president Barack Obama, for instance, endorsed making as a mechanism to upgrade existing manufacturing industries and bring back "made in America" by virtue of returning to what Obama described as an intrinsically American cultural trait of entrepreneurialism: "America has always been a nation of tinkerers, inventors, and entrepreneurs…access to technologies that support making… are enabling more Americans to design and build almost anything" [94]. In early 2017, the Brookings Institute featured a piece by Mark Muro and Peter Hirshberg, stipulating that the Trump administration would be served well if it continued support of America's maker movement to implement the new president's campaign promises to usher in a "new industrial revolution" [75].

Across these countries, characterized by vastly different political, economic, and social processes, political leaders have been seizing opportunities linked to the promises of digital fabrication, pressing citizens to become self-entrepreneurial and by extension, collectively innovative. These cross-regional imaginaries of a maker-entrepreneurial future share a language, deployed by technologists and politicians alike, that is often hopeful and future oriented. The focus is on opportunities visible in stories about mass employment and individual empowerment, enabled by technology production *and* the ability of citizens to transform themselves into economic actors. What we see at work, here, are shifts in how technologies, and more specifically visions of a future of a renewed technology production, are embedded in processes of governance. Governance as used by political scientists refers to "the means through which a social formation makes, or decides not to make, decisions" and constitutes the actions of state institutions such as policy makers, legislators, and courts as well as other powerful non-state institutions and professional groups, e.g. scientists, technologists, and corporations [33, p.97]. Visions and practices of making, innovation, and tech entrepreneurship, we argue, have emerged as contemporary sites to tinker with governance in a moment in which there are ongoing shifts in established arrangements of geopolitical power, global leadership, and the role of science and technology for nation state building. By "tinkering with governance"[2] we mean that a variety of actors, including government officials, policy makers, technologists, designers, and investors, are experimenting with who is included and excluded from political processes based on people's ability to self-fashion as both technological and economic actors. In other words, they are redefining the relationship between state and citizens through an individual's capacity to (re)produce herself as an entrepreneurial actor capable of actively contributing to the creation and expansion of economic markets through technology production. By drawing out such processes of tinkering with governance, this paper contributes to CSCW scholarship in the following ways.

First, it draws attention to technology design and production as the site of political work. From its inception, the field of CSCW has been concerned with how computational technology shapes conditions of work and labor as well as the relations between managers, designers, and users of technologies. CSCW scholars who work on civic technology, for instance, have shown how technology and technologically mediated work practices figure in brokering relations with city and other government officials [48, 50, 53, 54], while others seek to intervene in policy to shape market processes, labor relations, and capitalist exploitation [9, 29, 90]. This work is political, as it strives to transform established social and economic processes, and yet is only rarely acknowledged as such [7, 15, 17].

[2] The notion of "tinkering with governance" is rooted in an understanding of government as including not only formal state structures but also self-control and self-governance as articulated by Foucault in his work on the topic [29]. Governance in Western democracies, Foucault argued, operated through de-centralized power. For instance, instead of banning cigarettes, behavioral norms of non-smoking would be communicated to individuals, encouraged to self-regulate and self-govern their behavior. Contemporary expressions of encouraging citizens to become economic actors to advance national interests has family resemblances to Foucault's notion of self-governance. Individual identity and meaning, Foucault stressed, are not fixed, but subject to interpretation, a product of social norms and beliefs, and contingent on time. Contemporary calls upon citizens to become entrepreneurial, similarly, are contingent on contemporary imaginaries of living in a moment of uncertainty due to economic instability, unemployment, environmental catastrophes, and increase in precarious work conditions.

Second, we unpack how tinkering with governance has unfolded through positing the relationship between technology and citizens in economic terms. In other words, we are concerned with how a political economy of tech entrepreneurship and making came into being, focusing on the kinds of political and market driven interests that were congealed behind a rhetoric of optimism and future thinking. Political economy typically refers to a broad scholarly field drawing from traditions in classic liberal economic thought focused on the study of economic systems in relation to the functioning of political institutions and arrangements. In "Capital: A Critique of Political Economy" Karl Marx [65] famously outlined how classical economy's thought coagulates the workings of capitalism by "postulating that categories like commodities, money, exchange value, capital, markets or competition are anthropological features of all society, thereby ignoring the categories' historical character and enmeshment into class struggle" [65, p. 83]. In other words, Marx critiqued classical economists for portraying the capitalist economic system as natural and inevitable. Recent studies of digital labor have articulated how Karl Marx's critique of the political economy of capitalism can complement more recent poststructuralist approaches committed to studying globalization, capitalism or "the information society" as contingent processes instead of construing them as stable categories or meta-narratives [18, 29, 51]. They argue that, in the spirit of critical political economy, the study of social media like Facebook and Twitter, and of digital tech use and production more broadly, should include critical analysis of *processes* of labor, class, exploitation, commodification, and value extraction, *e.g.* [18, 29, 51]. Following this spirit of studying *processes* of economization, we unpack how powerful actors including politicians and policy makers as well as technological elites such as start-ups, entrepreneurs, and corporate representatives position the ability of citizens to transform themselves into technology producers, innovators and entrepreneurs as key to a future of social and economic life on a national and global scale.

Prior work in science and technology studies (STS) has analyzed such "strategic practice of designing or using digital technology to constitute, embody, and enact political goals" [35, p. 15] as technopolitics [35, 72, 74]. With this focus on technopolitics, the third contribution of this paper lies in expanding prior work in CSCW that has emphasized the importance of including political actors, policy makers, as well as cultural imaginaries and political economy in our analyses [21, 22, 58, 97]. Studying technopolitics means to make what is typically construed as "larger" or "external" forces within which technology design unfolds – *e.g.* capitalism, political economy – the very focus of analysis. It suggests that the making of digital technologies is not separate from or passively contained within capitalist processes. Rather, the making of technologies and the envisioning of particular technological futures *are* the very sites of political work, governance, and commodification.

In this paper, we show how a particular narrative of technology innovation and entrepreneurship was produced in specific sites, through specific visions and practices. We examine how relations drawn between tech entrepreneurship, citizenship, nationhood, and geopolitical power recast regions of the so-called former tech periphery such as Africa and China as sites of future making and opportunity [2, 12]. These articulations of future making in China and Africa are contingent on mounting critiques of precarious tech labor, economic instability, and the failures of modernist visions of technological progress mounted in the West. Focusing on such technopolitics, *i.e.* the ways in which political actions are embedded within technical forms and conversely, the ways in which the technical shapes the political [92], we show how tech entrepreneurship functions as vehicle for asserting political power and global reach by redefining citizenship in market terms.

## 2 RELATED WORK & BACKGROUND

CSCW, and its adjacent field of HCI has for some time now been committed to what Wong and Jackson called looking "beyond the moment of design, and above the level of the artifact" [97, p. 106]. This includes considerations of how technologies are enrolled in national and cultural imaginaries [58], political discourse [28, 34], social justice [22], inequality and political economy [21], politics of labor [39, 40, 42, 81, 82], as well as transnational and postcolonial processes [18, 41]. Across these efforts, scholars have employed various scalar lenses, from ethnographic research and civic technology design through to the analysis of policy discourse, corporate decision-making processes [39, 41, 42, 82], as well as the rhetoric of business executives

and productivity consultants [67, 68]. Taken together, this research shows how the work of technology design and production is performed by a multitude of actors, and how it is shaped by cultural and social desires, norms, and imaginaries [2, 97].

What has received comparatively little attention is how technological work itself is often motivated by economic interests, and is hence political by the very exclusions and inclusions it makes. Processes of capitalism or the political economy of capitalism are often considered universal structures and meta narratives, within which technology use and design unfolds, and as a "broader socioeconomic environment" that "designers and technologists might not have a lot of leeway in reshaping" [21, p. 48]. We adopt an approach from STS that provides an alternative lens and concrete ways of studying political economy or the so-called "broader socioeconomic environment" *as it is being made*. More specifically, we draw from a body of work that has shown in great depth the "economization" of technologies, *i.e.* the rendering of "technological things, behaviors, and processes as economic" [74, p. 3]. This process of economization, *i.e.* of making things economic, is historically contingent and disputable and fundamental to the creation of markets, political leadership and control [35].

A specific focus in this line of work that we find especially pertinent has been on "market devices," *i.e.* technological, discursive, and/or human actors that generate knowledge and practices, which create markets and thereby define their means of commercial exchange. Muniesa, Millo, Callon and others show for instance, that pricing techniques, accounting methods, monitoring instruments, trading protocols, benchmarking procedures, and economists themselves can function as devices to create markets [73, 74]. Hecht's work on the making of nuclearity, unpacks how in the 1960s a range of actors including mining companies, brokerage firms, geologists, economists, national institutions, and international agencies "all sought to facilitate the sale and purchase of yellowcake by turning uranium ore into a commodity governed by economic mechanisms" [35, p. 53]. Hecht analyzes various technologies and practices as market devices including "reserve estimates of how much uranium a particular country possessed, forecasts for how much uranium would be required in the future, and prices paid for a pound of yellowcake." Her analysis highlights that "experts and industry leaders portrayed the uranium market as an autonomous entity 'out there'" [35, p. 56] and in so doing "de-nuclearized yellowcake, turning it into a banal commodity subject to the laws of the market" [35, p. 35]. Hecht, building on Callon, elucidates that despite claims to the contrary, "politics and economics remained tightly bound in uranium's market devices", such that by "invoking the 'free market' imperial powers could continue to dominate former colonies" after independence, at a moment where their global domination was being contested [35, p. 35].

In a similar vein, we show how policies and practices of tech entrepreneurship, innovation, and making were aimed at turning citizens into both technological producers and economic agents (rather than consumers or users of technology alone), responsible for not just their own emancipation but also that of their nations. In other words, citizenship, redefined through technology production and entrepreneurship, was turned into a market device. This was couched in a story of participation and empowerment, rendered as devoid of political motivations. By depoliticizing or making apolitical the goal of economic freedom by entrepreneurial and technological prowess, these narratives diffused the responsibility for the national economy into the individualized actions of citizens. We will show in this paper how market considerations and visions about future economic and global leadership were expressed and enacted through technological decision making. In what might arguably be described as a project of neoliberalization, the state here further recedes from a role of regulating markets and delegates responsibility of market creation to individuals. Drawing from Latour, Collier reminds us that such processes of neoliberalization should not be understood "as a dark and pervasive force that can explain 'vast arrays of life and history'" [14, p. 12]. Instead, he argues, we should turn towards neoliberalism or political economy as a "problem of inquiry" by focusing on how they are being produced in particular moments and by the coming together of a multitude of actors, visions, infrastructures, and things [14]. Wong and Jackson have explored this in CSCW through the study of sociotechnical imaginaries (drawing on [44]), i.e. broader cultural beliefs and values that shape visions of the nation state [97]. In this paper, we build on their approach to study not only cultural beliefs, but also how economic desires and stories of the market are enacted through technological production.

## 3 METHODS

Our approach is multi-sited and ethnographic, spanning more than seven years of research conducted by the two authors in China, the United States, and Ghana. For the purposes of this paper, we draw out specifically a subset of our findings that focuses on shifts in technopolitical discourse we observed over the years, how they were articulated and enacted across policy texts, urban redesign, entrepreneurial activities, and media accounts. Our view is necessarily historic and expansive as we draw upon years of ethnographic work and discourse analysis. The different modalities we present, both in their constituent parts and as a whole serve distinct purposes. For instance, we combine official government accounts and texts with interviews we conducted with government agents to show how particular discourses of technological empowerment shifted over time. We draw from interviews with interlocutors in the tech entrepreneurship, venture capital, and maker scenes as well as media coverage to show the ways in which citizenship is both enacted and articulated through technopolitics. This data is grounded in many years of observation, personal reflections and field notes which allowed us to trace shifts in technology narratives and practices over time. We hence deploy a writing style that is using only minimal thick description (which we have offered in other publications drawing from the same ethnographic research) in favor of relaying themes and interpretation cutting across our ethnographic engagements – an approach common to anthropological writing [16]. Where we reference or quote from our interviews, we use pseudonyms for our interlocutors.

Altogether, our data is comprised of several hundreds of interviews with tech entrepreneurs, start-ups, investors, policy makers, government officials, urban planners, and designers as well as several years of observation across diverse sites including start-up innovation hubs, makerspaces, policy meet-ups, tech events, trade shows, design and art festivals, and conferences. We have written extensively about our various sites and methods in our prior publications, to which we direct the interested reader for further details [2, 3, 56, 57, 59, 95]. We followed Clarke's approach of situational analysis, studying themes as they emerged from ethnographic research alongside and through discourse analysis [13]. This approach is well suited to avoiding the trap of taking discourse and political processes to be a "larger" context within which other practices then unfold.

## 4 THE FUTURE IS MADE IN CHINA

In 2010, China's first hackerspace opened its doors in a small co-working space in Shanghai. Only a year later, there were ten more such maker related spaces spread across different cities in China including Shenzhen, Beijing, Nanjing, Ningbo, and Hangzhou. Another 5 years later, in January 2015, the Chinese Prime Minister Li Keqiang (**李克**强) visited one of these grassroots community spaces, Chaihuo (**柴火**) in Shenzhen, Guangdong, South of China, during an official tour of the South of China. The prime minister lauded Chaihuo for its "entrepreneurial spirit" and "innovation capacity" [87]. Upon his return to Beijing two weeks later, Li Keqiang declared a new national policy called 'mass entrepreneurship （**大众**创业）, mass innovation （**万众**创**新**）, mass making （**众**创**空**间）' that should proliferate a maker approach to the nation as a whole. By 2016, the new Five-Year Plan of China, a key policy document, centrally featured notions of tech innovation and entrepreneurship not only as important pillars of the Chinese economy, but as a paradigm that would shape how education, foreign policy, and even governance was conducted in future.

After the prime minister's official visit to the Shenzhen makerspace in January 2015, numerous government speeches and writings on the topic of making, entrepreneurship, and innovation were released. Various politicians began articulating how a "maker" approach was ideally positioned to help China cultivate an attitude of "self-making" and "self-entrepreneurship," which in turn was envisioned to help democratize innovation, technology and scientific advances beyond a set of privileged few. They spoke of the importance to develop concrete methods, provide services, and platforms that would enable Chinese people to innovate. A key rhetorical strategy deployed throughout these documents was a story of promise and hope for China's future, a radical departure from earlier political discourse in China that had emphasized the lacking of creative thinking and the low 'quality' of its citizens as a key reason for why the

nation was still lagging behind on its path towards becoming a modern nation, and recognized as such by the West [47, 59, 98].

In contrast, the new policy documents and political speeches told a story of opportunity that would arise from within China, rather than by virtue of adopting Western models of capitalism and tech development. While the 2008 financial crisis sharpened people's doubts over earlier promises of technological progress alongside the continuous rise of inequality in Europe and the United States [32], in China, the same period was portrayed by Western media and Chinese commentators alike as an optimistic one [11, 77]. Callahan describes this as a "shift from locating the future outside China (by figuring China as backward and the West as advanced) to see China itself as the future" [11, p. 8]. The build-up of "makerspaces" was positioned as a concrete approach that rested on exactly this idea of China itself as a place where the future was now made – hopeful and promising for both national and global tech industries. This approach would – as the Chinese prime minister described it – "nurture an environment for entrepreneurship and innovation as well as to allow people to realize their full potential" [87].

None of these events occurred in isolation or in a linear fashion as the account above might suggest. Rather, they each constituted moments that crystallized shifts in the ways in which political, technological, and economic elites began thinking about the relationship between technology, innovation, the future of their nation, and modernity. By zooming into such moments and their specificities, we see how seemingly universal frames of tech innovation and entrepreneurship were formed and enacted in their particulars.

In 2015, during a speech at the Shanghai Pujiang innovation forum, China's minister of science and technology, Wan Gang (万钢), put this more succinctly: "This is part of the new normal; we need to better transfer academic research into commercial products; science should serve our economy… open source and open hardware can help realize this innovation strategy. We encourage crowdsourcing and mass entrepreneurship in society so that resources are better distributed… It's the opportunity of the majority, rather than just the privilege of the few, to realize a lifelong dream." Wan Gang here referenced two key phrases that have pervaded recent political discourse in China: "China's new normal" and the "Chinese dream," a phrase coined by president Xi Jinping (习近平) shortly after he took office in 2012. We briefly unpack the relevance of both terms for the purposes of our argument.

China's "new normal" is a phrase that has been widely used by the Chinese government since 2014 to refer to a state of altered social, economic and political conditions due to what international media speculated as the first significant slow-down of China's vast economic growth since the 1980s opening up reforms. China's "new normal" signals that heightened instability, precarious work and life conditions, and insecurity from the rise of college graduate unemployment to the increasing informalization of work [49], have literally become the norm, and with it, the fear over political unrest due to shifts in the economy and labor markets. This informalization of work, as Kuruvilla, Lee and Gallagher demonstrate, was characterized by a dramatic increase in short-term contracts that lack health insurance, benefits, pensions, and unemployment insurance, and the dissolution of previously common life-long job security, previously known as 'the iron rice bowl'. The new mass makerspace initiative was positioned as a hopeful intervention into China's new normal. Making, various politicians posited, would proliferate an economy of mass entrepreneurship which in turn would help address this new normal by "stabilizing economic growth" and "creating job opportunities."

The shift in tone in these policy texts is significant. Notions that had centrally figured in the WTO-era creative and cultural policy reforms since 2001 [98] such as cultural production, creativity, and stipulations to overcome a past of foreign imperialism, had given way to new terms such as innovation, entrepreneurship, making, and China's future. While earlier policies on technology and creative industry development had strongly favored a neoliberal rhetoric that incorporated only select few into key decision-making processes [78], the mass makerspace initiative retained a neoliberal tone of self-entrepreneurship but, crucially, reframed it as an inclusive project. In other words, the mass makerspace policy not only expanded, but also turned earlier attempts to transform and upgrade the nation into a producer of knowledge into something that was now within reach. The spread of creativity and innovation was thus cast in a language of promise and opportunity for all, concrete action, and optimism.

This rhetoric of promise tied to the idea that individual citizens would transform themselves into makers, entrepreneurs, and innovators was in line with a new national discourse initiated by president Xi Jinping, shortly after he took office in 2012, that deploys the notion of "the Chinese dream" (中国梦) to cultivate citizens as participants in the national project of what the government officially called the "rejuvenation of the nation." This mode of governance, while firmly retaining and perhaps even expanding the reach and control of the party, involving state planning and a belief in "hard" science and technology, allowed at the same time various experiments with economic, technological, and social organization and processes to unfold in the more informal and illicit corners of China's planned market economy [11, 77, 80]. This – what Heilmann and Perry call – "adaptive governance," *i.e.* "a readiness to experiment and learn (even from enemies and foreigners)," has been more recently expanded to include technology producers, designers, and innovators to join in on articulating and enacting multiple technological and economic futures for China [38].

During fieldwork in 2009 and 2010, the first author witnessed how the community spaces that people had set up from hackerspaces and co-working spaces to incubators became exactly that – at first tolerated and later officially endorsed – sites of experimentation with how one lived in China's new normal [57]. Those who founded or became members of these spaces described them as "safe environments" to enable others "try out new modes of working and living," which included modalities such as freelance work and entrepreneurship. Many emphasized how these "new" professional identities allowed them to develop safety nets as the social structures previous generations had relied on were dismantled and precarious work conditions were on the rise. Over the years, the first author witnessed how such articulations of the future began to shift. Earlier notions of coworking, incubator and makerspaces as modeled after Western and more specifically American narratives of technology innovation were rearticulated in terms of what China itself had to offer in order to build a more just and egalitarian tech industry (in China and beyond). Prominent advocates of these ideas in China had become key figures in the global maker movement who drew from long-term experience engaging with and or building open source hardware businesses, makerspaces, and incubator-type programs. Due to space limitations, we can here only cover their work on the surface, and ask the interested reader to consult our prior publications [56, 57, 59, 60, 61] as well as other work cited below for more in-depth accounts.

Between 2007 and 2012, a confluence of activities took place across different Chinese cities that would later be articulated as having contributed to the emergence of a China-specific maker movement. As early as 2007 and 2008, Seeed Studio and DFRobot, China's two key open source hardware businesses, now well renowned as members of and contributors to the global maker industry, were established. Seeed Studio began as a small two-people business in Shenzhen, while DFRobot started as a transnational project of hobbyist roboticists between Shanghai and London. DFRobot was embedded in an eclectic collective of artists, technologists, designers, and freelancers, a subset of whom opened China's first hackerspace in Shanghai in 2010 [57, 60]. By 2011, many of these entrepreneurial efforts in open hardware and making had been connected through mailing lists and gathered for the first time in China's first big maker-related event, the 2012 Beijing Maker Carnival. The same year, one of the first Shenzhen-based hardware accelerator, funded by a European venture capital firm, opened its doors in Shenzhen, attracting international makers eager to move into hardware entrepreneurship in the south of China. The people involved in these activities had not only set up new businesses and spaces, they had also, crucially, begun articulating new conceptions about the relationship between global tech industries, China, and innovation. While much of their earlier work was focused on adopting principles of innovation associated with Western innovation hubs like Silicon Valley (including things such as freelance work, venture capital funding, IP), this had begun to shift as rising criticism mounted from both Chinese and Western tech networks of the kinds of precarious models of creativity Silicon Valley represented [61].

What the first author witnessed to emerge in the years to follow was a turn towards China as offering models of entrepreneurship and economic citizenship that provided seemingly hopeful alternatives to the West [61]. European and American designers, makers, and entrepreneurs began documenting their journeys to the manufacturing region in and around Shenzhen, in the South of China, which they described as a

Silicon Valley of Hardware, a notion that was later taken up by prominent Western media like Wired UK [94] and the Economist [20]. They celebrated Shenzhen as a place that concentrated an informal economy of copycat, craftsmanship, and large-scale production that they perceived has having much in common with the ideals of open source and as something that the West had abandoned in lieu of creating a knowledge economy. Prominent members of the international tech industry legitimized such stories of Shenzhen as a rising innovation hub. For instance, in 2014, Joi Ito, head of the MIT Media Lab, commented, after a visit with students to Shenzhen that China constituted a "role reversal" that he argued many in the West failed to see: "They were willing and able to design and try all kinds of new processes to produce things that have never been manufactured before. Their work ethic reminded me of the founding entrepreneurs and engineers in Japan must have been like who built the Japanese manufacturing industry after the war" [43]. A year later, Neil Gershenfeld and his collaborators at and beyond MIT began an official partnership with the city of Shenzhen, one that promised to implement Gershenfeld's vision of a future of fabrication on a mass scale. Shenzhen was touted as a fab city and as a 'fablab 2.0' that would enable the expansion of the fablab vision from building "machines that makes machines" to "cities that make cities." The promise of Shenzhen as a region to prototype hopeful futures became seemingly naturalized, expanding from one-off commentaries to a series of partnerships between a range of cities and regions in the West including but not limited to Silicon Valley, Detroit, Barcelona, and Vienna.

These partnerships with prominent universities, incubators, and investors in the West drew the attention of both city and national governments. It was in some ways all but surprising that the Chinese prime minister would, during his tour to Shenzhen in early 2015, endorse these efforts in making and entrepreneurship as promising for China's future as this was the narrative that a variety of influential actors from both China and abroad had already been tinkering with since 2008. As Chinese and Western technologists began turning towards the South of China, they made self-entrepreneurship the market device with which to transform particular regions, cities, makerspaces, and even factories into an economy of future making. That is, the promise of technological progress and innovation in future, and China as its new enabler, spurred investment and the creation of new markets.

## 5 GHANAIAN TECH ENTREPRENEURIAL POLITICS

In 2013, to much fanfare, the then president of Ghana, John Dramani Mahama, together with the CEO of *rlg* corporation, a company that described itself as "the first indigenous African company to assemble laptops, desktops and mobile phones and offer ICT training in computer and phone repairs" cut the sod for a largescale project named "Hope City". Designed by Italian architects and located just on the outskirts of the busy capital of Ghana, Accra, Hope City was supposed to be a $10 billion tech hub that would house among other things, a tech university, an office park, an R&D hub, and housing for tech workers. Two years later, a "tech industry analyst, who requested anonymity because of the [alleged] politically sensitive nature of the project" proclaimed to Al Jazeera America that Hope City was dead and that "there's no hope"" [93]. Playing on the name of the project to indicate how little faith he had in the success of such a project, the nameless industry insider emphasized the supposed failure of the Ghanaian government to grasp the potential of the technological future industry actors envisioned for the nation. The government appeared content to delegate the responsibility of that future to citizens by turning them into economic actors who 'invest' in the country's growth. In his speech at the sod-cutting ceremony, President Mahama proclaimed that the Ghanaian government "has led growth since independence with all the major investments… The time has come for the private sector to take over…. We can see that already in several sectors, including ICT and telecom" [8].

People in the tech industry, it appeared, agreed with him. Peter A., a co-founder and manager of Freedom Hub, [3] one of the larger tech hubs dotting Accra's landscape, [4] said in an interview with the second author in

[3] The names of interviewees have been changed as have the tech hubs. We use the style of first name and last initial to differentiate such persons from public figures (such as ministers of state) mentioned in this section.

2016 that "for the last 50 years, we've seen the government do the same thing over and over again, expecting different results but the social issues are just compounding." Rather than leaving it at that, he added, "we think that people in the private sector, people in hubs, people who have the fire and the resources at their disposal are the next generation. They are the people going to lay the foundation in the next 10 years". Similar to other Ghanaian tech entrepreneurs the second author met throughout her research, Peter A. thought anyone working in the tech industry was doing important work for Ghana's future, and was acting as a key agent to generate what his co-founder, Henry Y., called "the Ghana template" that could generate their own unique version of the kinds of success stories told about 'startup nation' Israel and Silicon Valley. During fieldwork in Accra's 'startup scene' in 2016, many young people working in the tech industry like Peter A. and Henry Y. applied their work towards addressing Ghana's challenges. In the key places that served as tech hubs and co-working spaces, startups worked long hours on their products, new entrants met with veteran technologists to tinker with particularly knotty issues, and outside that space, tech entrepreneurs started appearing as visible personalities on radio and TV. Between 2015-2017, media organizations in Accra, such as Citi FM, hosted events on tech innovation and business, sometimes with ministers of state, but more often with tech entrepreneurs as key speakers. In the Accra tech hubs, much of this activity was focused on software development alongside entrepreneurial pursuits to turn software prototypes into commercial products. Foreigners, mostly from the West, periodically came through, sparse in number but constant in presence.

That these tech entrepreneurs seek a Ghanaian template of technology production and impact is a crucial point. Being familiar with what one might call the global Silicon Valley, its parlance and practices, tech entrepreneurs in Ghana appeared bent on learning lessons from the global and adapting them in ways suitable to the politics and social context of Ghana as a postcolonial country with a history of exporting commodities and importing finished goods. Innovation in the Ghanaian tech space as described by those who were actively championing it, was not limited to material production or simply technological goods. Innovation referred more generally to a fundamental shift in mindset, one that Henry Y. articulated as what "makes people think they can do anything… [a] very systematic way of looking at problems and hacking them from the ground instead of waiting for policies to change." Policies, as various interlocutors described to the second author, could be summed up as slow bureaucratic instruments that were controlled by short sighted politicians who were more or less staring at the future but could not see it.

Within a few years of starting Freedom Hub, Henry Y., Peter A., and their team had become part of a network of social and tech entrepreneurs who actively worked to promote new ways of thinking and leading a tech entrepreneurial life. A mix of 'change makers' (a World Economic Forum term they use), tech enthusiasts, social entrepreneurs, academics, artists, journalists, and bloggers, this loose network has decidedly taken a turn towards actively working towards political and economic influence in Accra and the rest of Ghana. One set of events involving these individuals encapsulates how this unfolded. In 2016, members of this network collaborated with the British Council on a forum on social entrepreneurship. The Ghanaian minister for trade and industry at the time, Ekwow Spio-Garbrah, attended the UK government sponsored event, saw what attendees claimed were evidence of social entrepreneurship's success in the UK and afterwards asked how he might implement such a policy in Ghana. A couple of people in attendance including a professor at one of Ghana's premier private university, the director of an internationally known Ghanaian NGO, and a consultant from the British Council took the opportunity to form a 'task force' that drafted a Ghanaian policy which was then sent to the minister for comments. Henry Y. who formed part of this task force, argued that the Ghanaian tech 'ecosystem', per the task force's understanding, needed 1) knowledge and innovation, 2) research and advocacy, 3) investment, and 4) policy. The first three, he said the task force was confident, could be tackled by industry and academia. What they couldn't do on their own, "… even if we try a million times, is policy, so how can we bring that last element to the table?" It was exactly such strategic intervening in spaces of contact between different nodes of power in Ghana that

[4] Tech hubs in Ghana refer to physical spaces open to the public that function as co-working spaces, tech and business incubators, and general-purpose events hosting venues. Accra Freedom Hub is a popular one located in a trendy and historic neighborhood in Accra.

allowed them to bring policy "to the table". In this way, the government of Ghana had allowed a shift of economic and political ideation to tech and social entrepreneurs.

Another central actor in this process was what can be characterized as the 'NGO infrastructure' in Ghana. As noted by scholars on contemporary postcolonial Africa, international organizations and NGOs (non-profit/non-governmental organizations) of various kith and kiln have been slowly working their way over time into governance structures [4, 23, 24, 25, 26, 27]. Anthropologist Julia Elyachar, for instance, describes the relationship between 'the state', 'international organizations,' and 'NGOs' to be part of the story of changing forms of power enacted through informal means in Egypt [23]. We would argue here that both the informal and formal came together in spaces such as Accra Freedom Hub where a constellation of power brokers all try to assert their positionality in a world that is rapidly ascribing economic and political agency to technological things, actors, and algorithms.

Gereffi and colleagues contend that codes of conduct, standards and social pressures that emerge at the intersection of NGOs and industries that build plants and employ labor forces in the global south ultimately weaken local government in the south [31]. Arguing that this 'private governance' will not disappear anytime soon, Mayer and Gereffi claim "it will be linked to emerging forms of multi-stakeholder institutions" [66, p. 1]. Among others, the Broadcasting Board of Governors (BBG), the arm of the US government's Information Agency that oversees Voice of America, Radio Free Europe, and other overseas media organizations have sponsored events in Accra's tech hubs and co-working spaces, as has the Danish government as part of its 'cultural' initiatives. The British Council which is part of the British foreign and commonwealth office, have routinely organized events about technology ostensibly to be a catalyst for innovation growth. Indeed, the constellation of actors in Ghana's 'tech scene' in the last few years has morphed into a transnational space of flows in which foreign offices of Western governments and intergovernmental organizations such as the World Bank appear to be diligently employing Silicon Valley type modes of thinking and practice to experiment with new forms of governance in places like Ghana where they continue to expand their influence [4]. Accra Freedom Hub is emblematic of how ideas about technology innovation and entrepreneurship are valorized by an amorphous set of actors whose political motives are alternately conspicuous or hidden, depending on who you are speaking to. The hub was built to get people with such a mindset together in a physical space to, "enable them chase their dream" (Henry Y.). This space grew from the frequent gathering of a few enthusiastic people in Accra into a stable network of people at local site of a US university experimenting with tech entrepreneurship, primarily software development. Some of them formed a team that would receive financial investment from the US State Department during an apps building competition. They opened what they called an 'incubation room' in one of the university's buildings, and that soon had enough traffic and interest to enable them raise an additional $40, 000 to secure a space for co-working in a much larger building away from the university.

This space became known as Accra Freedom Hub and is today known as one of Accra's busiest tech hubs. It is known as a space that tech entrepreneurs, 'change makers', tech enthusiasts, and the like can productively leverage to connect Ghanaians and foreigners who speak of and implement the future of technology and Ghana's economy. Earlier, in 2015, the founders thought they had reached a point where they could "become a local hub that has global leverage" and began exploring global networks of hubs that they could join. Freedom Hubs International, an agglomeration of tech hubs around the world, offered a mix of ingredients Accra Freedom Hub felt aligned with. After 8 months of negotiations they were part of a new global network. During that time, the team of co-founders conducted feasibility studies on their own operations, something they described as providing them clarity. Today, the hub focuses on health, education, agribusiness, financial inclusion, renewable energy and culture. In mid-2016 they opened a health enterprise incubator and expanded their holdings to a neighboring building out of which they rent office space to local business. In early 2017, they secured funds from the nonprofit foundation arm of a German tech conglomerate to build a makerspace. Joining Freedom Hubs thus meant receiving an institutional stamp of belonging to a 'truly' global collaborative network.

Through a bricolage of ideas and attitudes, Accra Freedom Hub navigated the politics of being an 'African' organization in a 'global' industry, by enacting their role as tech entrepreneurs as a device for the creation of new markets and technopolitical agency. As tech entrepreneurs took on roles the government

failed to fill, the nature of political work itself changed. Positioned as translator between Ghanaian 'techies', international corporations, organizations, foreign and local governments, Accra Freedom Hub became a central actor in shaping who constituted a relevant economic actor of political relevance to Ghana. In their earlier work, many of the members of the same network of the tech entrepreneurs and startups Freedom is part of construed political work as outside their activity range and the government as an impossible actor to work with. The second author observed how this attitude shifted between 2012 to 2016 towards an active commitment to take on policy work and to attach politicians to their own vision of tech enabled economic progress. As troublesome as they find the sort of "donor" presence that The British Council and others represent, spaces like Accra Freedom Hub allowed its leadership to navigate a sociopolitical environment in which, they argue, their government favors foreign expertise to local ones to set key agendas for political and economic processes [2].

## 6 DISCUSSION

There has been considerable debate in CSCW with regards to what should be included as sites of study in its scholarly program. With the rise of mobile computing, online gaming, social media, and ubiquitous technology more broadly, "computer supported cooperative work" appeared suddenly as an all too constraining and outdated frame. In a 2011 article, Kjeld Schmidt summarizes these debates and sharply critiques the field's tendencies to define all aspects of life as examinable by the same analytical and methodological lenses that CSCW scholars once applied to the study of work and the workplace [83]. Schmidt challenges, here, a view of technology that still pervades much of CSCW research until today; that of inevitable technological progress and of technology moving outwards from the confines of the factory and the workplace into all corners of life, seemingly without our doing. This notion of inevitable technological progress caused a dilemma for the field, as Schmidt poignantly explains. What was CSCW's legitimacy and purpose if technology was seen as having moved away from work itself? To avoid the dilemma, and to legitimize the field, Schmidt shows, a line of CSCW research formed in the mid to late 2000s with roots in ethnomethodology, and proposed that the very frames and concepts utilized to study work applied just as much to the study of play, leisure, the home, and other so-called "everyday" practices. As a consequence of this approach, Schmidt argues, CSCW has bought into the idea that we live in a post-industrial world, populated with creative citizens freed from menial labor and empowered to "play" with ideas rather than work with their hands.

In his critique Schmidt aligns with a body of scholarship, that has emerged largely outside of CSCW and that has begun to examine in detail contemporary phenomena such as digital labor, venture labor, and immaterial labor [76, 81, 84, 90]. This research has documented the rise of precarious conditions not only amongst factory workers, whose jobs are increasingly automated or outsourced, but also amongst creative workers, tech entrepreneurs, and start-ups [62, 63, 64, 69, 70, 76]. Changes brought on by digital labor platforms such as Uber and the incidence of rising unemployment and social instability due to continuous automation and outsourcing in manufacturing, these scholars agree, render earlier stories of the rise of a global creative class and of inevitable technological progress naïve at best, and harmful at worst [39, 40, 82, 86]. Beyond digital labor studies, the CSCW adjacent field of Participatory Design (PD) has evidenced just how much of the "everyday," once championed as a productive site of study in CSCW, has been turned into a lucrative market place by the likes of Facebook and Google. Users are turned into participants in the market economy and co-creators of economic value [6], while Amazon Mechanical Turk enacts a model apparatus of the assembly line of cognitive labor [42]. In the late 1990s, feminist critiques of Marxist analysis of the political economy of capitalism urged to expand our view to include feminized labor like housework, maintenance, and childcare, as valuable contribution to economic life [70, 81]. The economization of "non-work," of the everyday and of the informal by Facebook, Uber, and Amazon turned this once important critique on its head [10].

If Kjeld Schmidt was right and CSCW indeed went through a period of championing the informal and everyday as sites just as productive as the workplace itself, then our own field has been partially complicit in the economization of everyday practice. But even if Schmidt got it wrong or simply assigned too much

influence to a particular line of ethnomethodological inquiry in the 2000s, our own complicity with the tech industry is hard to disown. The field largely avoids tackling its own entanglements with corporations like Facebook and by extension with a Silicon Valley mindset of technological progress, individual empowerment, and contemporary technopolitics.

This tendency to see CSCW outside and above market processes and political ideology stems in part, we argue, from an analytical and methodological separation between technology design and technopolitics. While CSCW researchers and designers might consider what is both technologically and economically feasible [83], they tend to see themselves as having little power in intervening in capitalist and political processes [21]. This is in some ways surprising given the increasing political and economic voice technology researchers and designers are assigned. Indeed, as we have shown in this paper, we are currently witnessing a moment in which relations between technology use and design, governance, geopolitical power, and citizenship are being redrawn – with researchers and practitioners trained in engineering, design and technology research as central instigators. When citizens are encouraged to transform themselves into entrepreneurial subjects and productive agents that contribute to the furthering of their regions and nation states, citizenship is turned into a market device [35, 74], *i.e.* citizens are encouraged to align with ideas of technological progress and economic development. This economization of citizenship, we argue, is a continuation of earlier processes of economization of the everyday, which – as Schmidt observes – was very much so advocated by researchers in our field. A strong tendency displayed in HCI and CSCW (and arguably in technology research and design more broadly) to avoid tackling their own imbrication in processes of economization prevents these fields from living up to ideals of changing the world for the better.

At the same time, familiar stories of technological progress and economic development are being contested. In the West, since the 2007-2008 financial crisis, also often referred to as the great recession, crisis thinking and uncertainty have made earlier stories of hope, technological progress, and optimism appear naïve and outdated [9, 89]. Familiar institutional, economic and political structures appear to be crumbling and/or to be attacked from within [62, 64, 69, 70], whereas regions considered the former tech periphery (like Ghana and China) are touted as hopeful and promising for the future of the tech industry [2]. As new and old elites come together to tinker with governance through tech entrepreneurship, political work becomes technological work and technological work serves political interests at various regional, national, and transnational scales.

The very emergence and existence of the modern nation state has been enabled – as James Scott has famously shown [85] – through the deployment of technological instruments and tools, be that statistics, economics, or mapping. What we see at work in the stories portrayed in this paper is a reworking of the very idea of modernity, progress, and futurity and its relationship to the future of the nation state. How such grabs for power manifest vary and they are rooted in historical contingencies, including legacies of colonial and postcolonial power and control. American exceptionalism is closely tied to American military and industrial exceptionalism, both of which shaped Silicon Valley. In China, the state has been centrally embedded in economic development, all the while deploying neoliberal exceptionalism and capitalist experimentation since the opening reforms in the 1980s [38]. As the Chinese government has continued its experimentation with policy making at the site of tech entrepreneurship and making, it has not ceded power but rearranged it in ways that align powerful actors in technology production with the interests of the nation and hence the Communist party [38]. In Ghana, the government's designation of tech and innovation as lower priority to pressing (and visible) concerns of healthcare, education, and infrastructure, has given the emergent tech scene carte blanche to be active in shaping the future of technological innovation in the country.

These more recent expansions of economization of people's relations to the state (often also called neoliberalism) make it more pressing than ever for researchers and designers of digital technologies to acknowledge their own relative position of power and influence in shaping relations of markets, technologies, and politics. To recognize that processes of designing, implementing and envisioning of digital technologies are necessarily political, as we have shown in this paper and others have argued before us [7, 17], is a first step towards identifying ways to intervene in the political and economic status-quo. A second

step, we argue, is that we confront how the field has construed intervention and where it has located agency to intervene in the past. For the remainder of this paper, and by way of concluding, we outline how these two steps contribute a potential pathway towards an interventionist enterprise of CSCW.

## 6.1 Towards an interventionist enterprise of CSCW

Researchers and designers in CSCW and related fields like HCI have expressed a strong commitment to "doing good" and to making the world a more just and equitable place. Such commitments often materialize in the form of technological designs that assume individuals as moral change agents, who, empowered by technology, begin to alter their own behavior and actions [17]. Using sustainability discourse in HCI, Paul Dourish has examined the limitations and consequences of this approach. HCI promotes, he argues, "sustainability as a matter of personal morality rather than industrial regulation or political mobilization," [17, p. 2]. This "framing [of] sustainability in terms of personal moral choice in a marketplace of consumption options may obscure," he argues, "the broader political and regulatory questions that attend significant change" [17, p. 4]. This concealing of market logics and capitalist structures renders them as natural and inevitable and hence impossible to alter, Dourish highlights – a provocation reminiscent of Karl Marx's critique of the political economy of capitalism. What remains as seemingly the only attainable course of action is to alter oneself and in accordance with what the market demands. This notion of inevitability extends well beyond the realm of environmental sustainability as discussed by Dourish. We have shown in this paper, how the story of a future of making and tech entrepreneurship presents the logics of capitalist markets as inevitable and the self-actualization of citizens as entrepreneurial agents as necessary for national and regional futures. Dourish offers an alternative approach that envisions technological intervention as one of "scale-making" rather than shifting responsibility from corporations and governments to individuals [17]. By scale-making, Dourish refers to the formation of alliances around social and political concerns even if individual actors might diverge and disagree. This notion of building solidarity that does not flatten across class, gender, or racial difference resonates with other adjacent efforts in feminist technoscience and science and technology studies, which have provided a rich methodological and analytical vocabulary of intervention.

Other scholars in CSCW and HCI have begun draw out possible affinities and alliances between the efforts in feminist and critical humanities on the one hand and technology design and research on the other, as carefully summarized by Jeffery Bardzell and Shaowen Bardzell [7]. A main stumbling block for such approaches to reach into other corners of HCI and engineering and design more broadly, Bardzell and Bardzell argue, stems from a tendency in design and technology research to avoid an explicit alliance with critical scholarship. This lack of acknowledgement in turn makes it "difficult for the community to build on them," [7, p. 142], and might undermine their potential reach, Bardzell and Bardzell warn.

In this paper, we have made a deliberate attempt to acknowledge and articulate our own influences rooted in STS, Marx's critical political economy, and feminist technoscience, with the hope to advocate for intervention at scales of market logics and political processes that does not rely on technology as a fix to societal problems. STS as a field has since its inception been committed to intervening not only into established academic disciplines (*e.g.* sociology), but also in the political and economic status-quo. While we can by no means do justice to the large body of scholarly work in STS that spans more than 40 years, we draw attention, here, to a key commitment that we believe holds the interdisciplinary field of STS together, *i.e.* the unmasking in historical and ethnographic detail what goes into producing seemingly inevitable structures and processes of power, exploitation, and control. Following this approach, we have deployed the analytical devices of technopolitics, economization, and market devices to show (and critique) how a particular form of political economy of tech entrepreneurship came into being. By demonstrating how established structures come into being we also begin to see possible alternatives and how it can be otherwise.

While CSCW and HCI have long drawn from the methodological and theoretical toolbox of STS, we are hoping, here, to highlight another – potentially much less explored – alliance between these fields.

Specifically, a shared interest in questions of technology production and how its politics of intervention could forge alliances between historians, anthropologists, critical theorists and technology researchers, designers, and engineers. We have shown in this paper, how contemporary forays into making and tech entrepreneurship are driven by a desire to intervene. This desire for intervention has received a sense of urgency amidst crisis thinking and perceived uncertainty. The shared goal to intervene, or to conceive and implement other and better forms of living, we argue, ties together different interests and positionalities, without forcing them to homogenize across or reconcile their differences.

Such alliances could flourish especially in teaching and education. Indeed, much of the recent economization of citizenship has played out in K-12 schools and university colleges. Across China, the US, Europe, and Africa, students and teachers alike are called upon to become entrepreneurial, by applying methods and principles of design thinking, STEM, and the lean startup [4]. The idea that the future of the nation rests on individuals capable to become economic agents has already begun shaping the kinds of educational programs many of us in CSCW teach in. What is urgently needed are approaches embedded in computer science, engineering, and design curricula, that train people not only in design and engineering, but in engaging deeply and critically with processes of economization and the many forms of inequality they proliferate. What if we taught students in interaction and user experience design not only how to study user needs (read: customer requirements), but also how to do political work and how to intervene in existing structures of power and inequality? What if we understood inclusion, diversity, and equity not as an add-on to but part and parcel of what design and engineering is all about? What if we took on seriously Schmidt's charge to make CSCW an "interventionist enterprise"?

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